The Metals REVIEW

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THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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Cedar Rapids Has First Annual Meeting

Seated at the speakers' table for the first annual meeeting of the Cedar Rapids Chapter ASM on May 8 are, left to right: A. R. Locke, trustee; Miss Fritz, assistant to secretary; George H. Taylor, secretary-treasurer; H. F. Allen, trustee; R. W. May, vice-chairman; Wm. J. Conley, Lincoln Electric Co., speaker; Henry Hauseman, chairman; "Pops" Harrison, State University of Iowa basketball coach; John Fielding, trustee; J. C. Falcon, trustee; M. B. Heisner, trustee; and R. F. Plumb, trustee.

Welding Metallurgy Is Technical Subject Discussed by W. J. Conley

Reported by George H. Taylor
Chief Inspector, LaPlant-Choate Mfg. Co., Inc.

"Welding Metallurgy" was the technical subject at the first annual meeting of the Cedar Rapids Chapter held on May 8. W. J. Conley, research welding engineer of the Lincoln Electric Co., was the speaker.

All carbon steels can be welded successfully, Mr. Conley pointed out, even eutectoid steels which have 15% ductility when cooled to produce pearlite. However, carbon steels which are normally ferrite must be cooled slowly enough so that when austenite decomposes the resulting envelope of ferrite around the pearlitic areas will be of maximum thickness. Since ferrite has the least yield strength of any of the constituents of slowly cooled steel, the ferrite deforms first. If the envelope of ferrite is too thin, not enough slip planes are available to allow the material to adjust itself successfully to the stresses set up during welding. Consequently, rupture of the ferrite takes place, resulting in welding cracks and subsequent failure of the weldment. The higher carbon contents, of course, develop hardened zones when the cooling rates are high enough.

"Pops" Harrison, coach of Iowa's Big Ten basketball champions, was the coffee speaker for the evening and recounted many of the amusing incidents of the basketball campaign. He finished with a request for the metallurgists present to compose a steel which would react and expand suitably whenever his boys shot at the basket so that the ball would always go through the hoop.

Detroit Educational Course Averages 250 Attendance

Reported by E. V. Ivanso
Metallurgical Engineer, Steel Sales Corp.

The Detroit Chapter's 1945 Educational Lecture Course consisted of five highly informative lectures on important recently developed metallurgical processes. An average of 250 people attended the meetings, the largest attendance being 360; 30% of those attending were non-members. The program of the meetings was as follows:

Induction Heating—Principles, Operation, Metallurgical Considerations, by Harry B. Osborn, Jr., research engineer, Ohio Crankshaft Co.

Cold Treatment of Steel—the Present Status of This Important Development, by Stewart G. Fletcher, research assistant in physical metallurgy, Massachusetts Institute of Technology.

Application and Appraisal of S-Curves—Putting the Results of Research of Work, by Alvin J. Herzig, vice-president and chief metallurgist, Climax Molybdenum Co.

Methods of Residual Stress Measurement—a Subject of Increasing Importance to all Engineers, by Charles S. Barrett, Carnegie Institute of Technology.

Shot Peening—a Panel Discussion, by J. O. Almen, General Motors Research Laboratories; F. P. Zimmerli, chief engineer, Barnes-Gibson-Raymond; R. L. Matson, General Motors Research Laboratories; and A. E. Proctor, Jr., metallurgist, Ford Motor Co.

M. L. Frey of Packard Motor Car Co. was chairman of the Educational Committee, which consisted of H. L. Grange, R. D. Chapman, H. J. Arnold, and D. M. McCutcheon.

Ontario Chapter Hears Howard Stagg

The monthly dinner meeting of the Ontario Chapter was held on May 18 at the Leonard Hotel, St. Catharines. Howard Stagg, tool steel division, Crucible Steel Co. of America, addressed the gathering on "Tool Steels." A resume of his talk will be found on page 6 of this issue.

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PASS-A-ROUND

	Name	Item No.
Many executives in your plant will want to see this record of what happened last month in the metal industry. Just fill in the names, note items for special attention—and Pass-A-Round.		

Flame Hardening Vs. Induction Heat Incites Vigorous Discussion

Reported by H. L. Millar
Metallurgist, Plomb Tool Co.

The May meeting of the Los Angeles Chapter was devoted to an informal discussion of subjects very close to the heat treater. As leader of the discussion on the subject of "Flame Hardening," William Patterson, National Supply Co., Torrance, incited a vigorous controversy between the proponents of flame hardening and those of induction heating.

In the comprehensive discussion of his subject, Bill named the most practicable applications of the process as: (1) The selective hardening of tools or machine parts for wear resistance and abrasion in some portions and only toughness in others; (2) the hardening of tools or parts of intricate shape with a minimum of distortion, and (3) the hardening of a small number of pieces periodically.

Torch Equipment Described

The speaker described the operations of various types of flame hardening equipment and concluded by naming three factors which influence these operations—the number of jets in the torch, the manner of distribution of water behind the flame jets and the grade of steel used.

Ed Brooker of U. S. Spring & Bumper Co. reviewed the history of carburizing from antiquity to modern practice of carburizing by liquid gas or solid pack. He outlined the chemistry of the process and emphasized the fact that a circulation of carbon monoxide is essential to good carburizing. In somewhat limited practice during the early part of this century, carburizing did not come into general commercial use until shortly after World War I when the cumbersome clay pots were replaced by the newly popularized nickel and chromium heat resisting metal pots.

Mr. Brooker named numerous applications of the process to illustrate the advantages of the different methods of carburizing.

A discussion of salt baths was conducted by Roland Soll of Warman Steel Casting Co., who listed the following properties as highly desirable for salt baths in commercial practice: Uniformity of composition, ease of maintenance, non-sludging properties, non-corrosive, water soluble, non-hydroscopic properties, water fluid in molten condition, and low cost.

Classifying salt baths into five groups, Mr. Soll discussed the compositions, temperature ranges, uses, maintenance, pot construction and precautions for use of each.

Brazilian Metal Society Meets

The first annual meeting of the new Brazilian Society for Metals, the "Associacao Brasileira de Metais," was held at Sao Paulo and Volta Redonda, Brazil, May 14 through 17, reports Dr. Tharcisio D. de Souza Santos, national secretary. Technical meetings were held through the week and several visits to plants were made. Fifteen papers were presented in Portuguese and preprints were distributed.

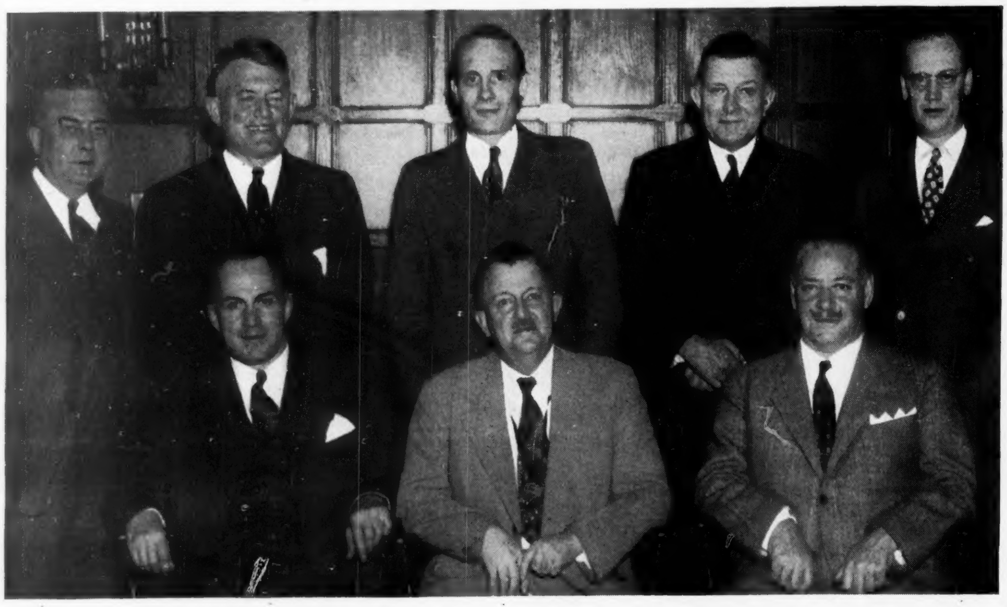
Registration totaled 167, an encouraging figure from a total and rapidly growing membership of 250.

Four Men Buy Firm of Pratt & Inman

The firm of Pratt & Inman, operated in Worcester, Mass., since 1829 by the Inman's, has been sold to four individuals, namely, George A. Peterson, George H. Campbell, Theodore C. Cederholm, and John R. Van Nest.

Campbell and Peterson were with the old firm and Cederholm and Van Nest are new members. Mr. Cederholm was formerly with Wyckoff Drawn Steel Co. of Boston as district sales manager, and Mr. Van Nest was with the American Brass Co. Boston office as sales engineer. The firm will continue to operate under the name of Pratt & Inman.

New Haven Celebrates Silver Anniversary



At the speakers' table for the Silver Anniversary celebration of New Haven Chapter were (standing, left to right): Prof. Arthur Phillips, technical chairman; F. J. Dawless, past chairman; R. M. Brick, vice-chairman elect; H. C. Irving, secretary; and L. A. Ward, chairman elect. Seated in front are National President Kent R. Van Horn, Chapter Chairman F. E. Stockwell, and National Secretary Eisenman.

Reported by P. H. Tomlinson
Metallurgical Engineer, Farrel-Birmingham Co., Inc.

The National Officers of the Society helped New Haven Chapter celebrate its Silver Anniversary May 17 with an excellent dinner (not steak) and congratulatory toasts. J. F. Sargent, past chairman and chapter historian, then gave a brief resume of the accomplishments of the Chapter during the past quarter of a century. F. J. Dawless, past chairman and representative of the first sustaining member of the Chapter, enlarged on this history as it pertained to the benefits derived by sustaining members.

Bill Eisenman in his own inimitable form, besides talking about Society activities, gave an enlightening dissertation on the problems of cattle raising. Kent R. Van Horn, national president, gave the main talk of the evening—a very interesting illustrated lecture on the subject in which he is so well versed, "Radiography of Metals."

Furnace Atmospheres Adjusted to Fulfill Varied Functions

Reported by A. H. Rauch
Deere and Co.

Atmospheres for the control and prevention of scaling, for prevention of decarburization, for gas carburizing, and for carbo-nitriding were the principal types discussed by John A. Dow, metallurgist, Holcroft & Co., before the Tri-City Chapter on May 8.

Carbon dioxide and water vapor are the offenders in causing scaling and decarburization, Mr. Dow said. He showed graphs giving the necessary ratios of carbon monoxide to carbon dioxide, and hydrogen to water vapor to prevent scaling at various temperatures. The ratio of hydrogen to water vapor sufficient to prevent scaling at a high temperature would cause scaling of the work at lower temperatures.

An atmosphere resulting from the combustion of a mixture having an air:natural gas ratio of 9:5 was said to produce on steel between 1000 and 1200° F. a blue-black oxide coating having slight rust resisting properties. Many postwar tempering furnaces will be equipped to use such an atmosphere, Mr. Dow predicted.

A non-decarburizing atmosphere described by Mr. Dow consists of 20 volumes of carbon monoxide and 35 volumes of hydrogen with controlled amounts of carbon dioxide and water vapor. This atmosphere is produced from natural gas by the catalytic combustion of an air:gas ratio of 2.5:1. Mr. Dow showed graphs depicting the amounts of carbon dioxide and water vapor necessary to maintain this atmosphere in equilibrium with steel of a specified carbon content. Addition of hydrocarbon to such an atmosphere, he said, to reduce the amount of carbon dioxide and water vapor by chemical reaction in the furnace chamber, is highly undesirable since an excess of hydrocarbon would carburize and with some tool steels could result in carbon contents at the surface of 3 to 4%.

Oil fumes in a gas carburizing atmosphere cause high carbon concentrations and even soot deposit on the surface of projections, such as the tips of gear teeth. This is apparently due to the chemical instability of the oil fumes at carburizing temperatures as compared to the relatively much more stable methane. Ethane is also less stable than methane and acts in a similar manner to oil fumes, but to a much lesser degree. This is, however, noticeable when carburizing with a weak gas to produce a surface case carbon content of 1.00% or less.

In such gas with ethane present, cases at the roots of gear teeth have been observed to be below eutectoid in composition, when examined in the annealed state under the microscope. Carburizing atmospheres free of ethane and other of the higher hydrocarbons, and depending on methane only as the source of carbon, produce more uniform cases under similar conditions.

Carbo-nitriding was described as the process of adding both carbon and nitrogen to the surface of a steel by employing an atmosphere of carburizing gas and anhydrous ammonia. The alloying effect of nitrogen permits carbon steels to be oil quenched to Rockwell C-65. The amount of retained austenite in the case can be controlled by the ammonia content.

Sulphite Treated Steels and Induction Hardening Discussed

Reported by John B. Segada
Metallurgist, Youngstown Sheet & Tube Co.

John M. Birdsong of the La Salle Steel Co.'s metallurgical engineering staff, in a talk before the Calumet Chapter on May 8, illustrated how section size and time at a given frequency are factors to be considered along with the chemistry for securing maximum engineering strength of induction hardened parts.

Three types of conventional equipment most generally used are motor generator (the oldest), spark gap, and vacuum tube (electronic). For deeper heat penetration low frequencies from 2000 to 3000 cycles are used, whereas higher frequencies of 300,000 to 500,000 cycles are used for a shallower heat zone.

Higher hardness is obtained through induction heating than can be secured by ordinary thermal heating. Fayville-LeValley tests to determine metal-to-metal seizure showed less tendency in this respect as the hardness is increased and brought out the advantage of induction heating parts that are subjected to this hazard in service.

Another interesting feature was the increased resistance of material subjected to double shear when induction hardened. This property is proportional to the carbon content.

Elbert A. Hoffman, also associated with La Salle's metallurgical engineering staff, shared the speaker's platform and elaborated on sulphite treated steels. He pointed out that steels treated in the ladle or mold with anhydrous sodium sulphite have a 25% higher machinability rating and tool life increased as much as 400%—in some cases without any apparent change in physical properties. He attributed this improvement to the partial elimination in the molten metal of the abrasive chemical compounds.

200-Lb. Bearings Now Being Made From Metal Powders

Reported by F. G. Wayman
Chemist, The Steel Co. of Canada, Ltd.

Oilite bronze bearings as large as 18 in. in diameter and others weighing more than 200 lb. each are now being produced from metal powders by the Chrysler Corp., Amplex Division, according to G. E. Platzer, chief engineer. Mr. Platzer spoke before the Montreal Chapter of the ASM on April 30 on "Manufacture of Machine Parts and Bearings From Powder Metals." Size is not recognized as a limitation but the economics involved act as the guide, he said.

Mixed metal powders, having an average screen size of about 250 mesh, are fed into a briquetting die by a shoe. Then an upper punch compresses the powder, a lower punch ejects the briquette, and the shoe sweeps it away and refills the die. The operation is then repeated.

Briquetting is followed by sintering—a heat treatment so termed because the melting point of only one of the metal constituents is reached in the process, and therefore the briquette maintains its original shape. The sintered bearing is then immersed in oil for a few minutes, then sized in dies to final dimensions and tolerances.

The entire process is likened to a housewife's cookie baking with the sifting of the flour, mixing, forming and baking all having counterparts in the powder metal manufacturing method.

Allowances of 0.001 in. on the inside and outside diameters of small bearings, up to 1½ in. in diameter, are quite normal. More liberal tolerances are necessary on large sizes. After sizing, the final step is oil impregnation, whereby the porous structure of the bearing absorbs a full complement of oil through capillary action. Oilite bearings contain about 30% of oil by volume. It is to be noted that the oil impregnated bearings operate under the principle of hydraulics and oil actually provides added strength.

Research has been carried out in many other types of powder metal bearings and parts, including bronze, ferrous, ferrous-base copper and brass. A bearing containing a large proportion of iron powder has been developed which has a static load capacity of 35,000 psi.

Chrysler's Amplex Division today has dies for more than 16,000 items, in sizes ranging from tiny oil impregnated rivets weighing 10,000 to the pound, to giant Oilite bearings approaching a weight of 200 lb.

In addition to manufactured parts, a full line of cored and bar stock is available in Oilite bronze, ferrous base Super-Oilite and Iron Oilite. These products are credited with saving thousands of man and machine hours and dollars. With a supply of these units on hand, a plant is equipped to provide its own self-lubricating units quickly by turning a piece of cored or solid bar stock to the desired dimensions. Not only do these products provide in just a few minutes self-lubricating bearings for maintenance or experimental needs, but in the case of bearing breakdowns, a permanent replacement can swiftly be secured, Platzer reported to the group.

An exceptionally fine display of parts and bearings of numerous sizes and shapes was prepared and exhibited by the Amplex Division.

General Electric Announces Plans For New Research Laboratory

A new $8,000,000 building for the General Electric Co.'s research laboratory, which will afford some 50 per cent more space than present facilities provide, is to be erected in a suburb of Schenectady as soon as WPB approval can be obtained, the company has announced.

The site has been a private estate known as "The Knolls" in suburban Niskayuna, and includes 219 acres. The new building will contain 200,000 sq. ft. of laboratory working space in addition to an auditorium seating 300, a dining-room, conference rooms, service facilities, machine shops and specialty shops.

Buffalo Chapter Has Annual Meeting

Reported by G. F. Kappelt
Assistant Metallurgist, Bell Aircraft Corp.

The Buffalo Chapter of the American Society for Metals held its annual meeting and election of officers May 10. The business meeting was concluded with the presentation of the past chairman's pin to George B. Michie, retiring chairman, and the evening was brought to a close with an enjoyable floor show. [New officers of all of the chapters will be published in the August issue of THE METALS REVIEW.—Ed.]

West Michigan Chapter Has Officers' Night

Reported by Roy B. Nelson
Nelson Machine Tool Co.

National Officers' Night was held by the West Michigan Chapter on May 21 with National Secretary W. H. Eisenman in attendance and Elbert A. Hoffman of the metallurgical engineering staff, LaSalle Steel Co., as the principal speaker. His subject was "Metallurgical Factors Affecting the Selection of Steel Bars for Surface Hardening". In the photograph are, left to right: R. L. Edison of the LaSalle Steel Co., who introduced the speaker; J. C. Scharmer of the Norge Division, Borg Warner Corp., Chapter treasurer; W. H. Eisenman; C. H. Lloyd, Chapter chairman; and Elbert A. Hoffman, the speaker.

New Magnet Alloys Development and Properties Described

Reported by G. A. Landis
Metallurgist, E. W. Bliss Co.

Highlights on magnetic materials were presented to over 300 members and guests of the New York Chapter on May 14 by W. E. Ruder of General Electric Co.

Advantages of the silicon steels, namely high hystersis and low eddy current loss, Mr. Ruder said, were exploited for transformer use after Hadfield's discovery of this material and the subsequent development of suitable rolling and fabricating techniques. Investigations revealed that controlling the grain size improved quality and uniformity; low carbon content and purity as indicated by vacuum melting contributed to the improvement. Finally, the orientation of the crystal grain by cold rolling and development of suitable manufacturing methods for the 6% silicon in place of the normal 3 to 4½% silicon steel, culminated the technical advances that made possible the reduction of losses from 1¼ watts per lb. to ⅓ watt per lb.

When better but more costly materials are desired the nickel-iron alloys, such as Permalloy, Mumetal, and Nicaloi (50% nickel), are used. They are chiefly used in radio, radar and communication but are not generally applied in the power industry in view of their lower saturation, higher cost, and the advances made with silicon strip and sheet steel. A magnetic anneal is particularly effective on "65" Permalloy which has its permeability enhanced as much as 100 times by this treatment.

Pure iron has been used for pole pieces but commercial ingot iron changes in aging and produces undesirable instability. Therefore, the purity obtainable by means of powder metal compacts subsequently worked makes this method of production for pure iron pole pieces attractive, particularly where considerable quantities are involved.

For highest magnetic saturation, the iron-cobalt alloy containing one-third cobalt is the peer of all known materials. However, it is not suitable on alternating current applications, although excellent results have been obtained on pole pieces for high power electro magnets.

For many years the only permanent magnet materials available were hardened carbon steels, either plain or subsequently improved by alloy additions of chromium and tungsten. Then came cobalt magnet steel which represented a three-fold advance in strength. The most recent development in this field is Alnico, the aluminum-nickel-cobalt series of iron-base alloys, which respond to precipitation hardening treatments. Choice of a particular grade of Alnico depends on the desire for high energy, high coercive force or higher residual magnetism. The "strongest" of these is Alnico V which has about five times the maximum external energy of the cobalt magnet steel.

Other new permanent magnet alloys which can be readily machined, forged, rolled, or drawn into wire have characteristics almost as good as Alnico, which can be obtained only in cast form and is not machinable. They are Cunico, a copper-nickel-cobalt alloy, and Cunife, a copper-nickel-iron alloy. Where insulation, high resistance and light weight are important considerations, a sintered compact of cobalt and iron oxides called Victolite can be used.

Lastly, the commonly termed non-magnetic materials (more properly called feebly magnetic) were discussed; these are used for special structural applications where particular combinations of characteristics are desired.

Numerous slides containing hitherto unpublished data were shown by Mr. Ruder. The nature and number of questions following the lecture attested to the interest and instructive nature of the meeting.

Gas Turbine, Jet Propulsion Open New Fields for Speed

Reported by Lawrence Jacobsmeyer
General Manager and Technician, Salkover Metal Processing

The basic principles underlying rockets and jet propulsion were described in detail before the Chicago Chapter ASM on May 24 by G. Edward Pendray, assistant to the president of Westinghouse Electric Corp. and a founder member of the American Rocket Society.

It was no fable, said Mr. Pendray, when Francis Scott Key used the words "rockets' red glare" when he wrote his famous song on that fateful evening during the Revolutionary War. Rockets were used then, and also many years before the Revolutionary War.

Slides were shown illustrating some of Mr. Pendray's early models and methods used for launchings.

It is Mr. Pendray's belief that reciprocating gasoline engines for airplanes are rapidly approaching their maximum practical size and gas turbine and jet propulsion will step in where the gasoline engine leaves off.

Rockets so speedy that a business man may breakfast in America, be whisked to luncheon in London, and back to the United States by nightfall after an afternoon conference in the British Capital, are among the possibilities forecast by the speaker.

Before the speaker was introduced, W. D. McMillan presented to the retiring Chairman, J. Walter Scott, a desk fountain pen set and a pigskin brief case.

Metallographic Structure Test Reveals Presence of Boron

Reported by B. R. Price
Westinghouse Electric Corp.

Pittsburgh Chapter terminated the current season with a double-barreled program on May 10. The principal speaker of the evening, R. A. Grange of the U. S. Steel Corp. Research Laboratory, delivered a technical talk on "Boron-Treated Steel," while E. S. Davenport, assistant to the vice-president, U. S. Steel Corp., acted as technical chairman.

Mr. Grange outlined some of the facts which have been learned in the past few years about the effects of boron in steel. Tests for boron, in particular a metallographic technique for revealing a structure characteristic of the presence of the element in steel, were discussed. It was evident from the remarks of Mr. Grange that a most interesting chapter in the metallurgy of steel will be written when wartime restrictions on the release of the material are lifted.

The stimulating discussion period which followed the talk was aided by Mr. Davenport's expert fielding of the questions.

The coffee speaker, A. A. Horvath, chemist of the Hagan Corp., presented a well-rounded and highly instructive talk entitled "Soy Beans in Nutrition and Industry." Dr. Horvath discussed the unique food value features and industrial uses of this crop.

Precision Methods For Making Small Parts Reviewed

Reported by Frank P. Kristufek
Research Laboratory, U. S. Steel Corp.

Each of three speakers at the April 16th panel meeting of the New Jersey Chapter ASM discussed the advantages, limitations, and possibilities of a specific precision method for making small parts. Frances H. Clark, metallurgist of Western Union Telegraph Co., spoke on "Powder Metallurgy," Albert W. Merrick, chief of the research department of Austenal Laboratories Inc., discussed "Precision Casting," and Sam Tour, president of Sam Tour & Co., Inc., talked on "Die Casting."

High Production Rate With Powder Metallurgy

Dr. Clark limited the discussion of powder metallurgy processes to parts of high density which compete with parts made by machining, grinding, etc. One of the advantages of powder metallurgy is the high production rate possible although there are limitations as to the shape of the part, since no undercuts are possible. Tolerances on the finished part may be ± 0.001 in. on those dimensions determined by the die wall, but in the direction of pressing, tolerances will be ± 0.005 in.

Powder metallurgy offers a real advantage in the production of pole pieces for d.c. electrical equipment made of an iron powder of high magnetic permeability. The high purity of the iron can be retained during sintering, since no melting of the iron occurs. Such parts are now being produced commercially in sizable quantities.

Disadvantages of the powder process are that die wear is excessive, and, in general, impact properties of high density powder metallurgy parts are low.

Precision Casting for Large Quantities

According to Mr. Merrick, the impetus of our wartime needs for large production of parts for gas turbine superchargers, from alloys that are not machinable, made precision casting a necessity. It is often referred to as the "lost wax" process because the wax or sometimes a plastic pattern is lost or destroyed by melting or burning out the investment. This leaves cavities into which the metal is cast by pressure or centrifugal force.

The speaker stated that precision casting is economical only in the production of vast quantities of intricate parts too difficult to forge or machine; however, it is also employed in small quantity production where the time factor is important, since intricate parts can be duplicated in three days and it is possible to begin production on an article two weeks after it has left the design board. This process seems best suited for small precision parts weighing from 1 oz. to 2 lb. since larger items, especially those with flat areas, are difficult to produce to close tolerances. At present, it finds its widest application in the production of parts which are subjected to high temperatures and severe stresses.

Castings of high alloy content, such as nickel-chromium heat resisting alloys, stainless steels and cobalt-chromium base alloys, are being produced on a large scale. To a lesser extent, tool steel and carbon steels have been employed and in general the process is more applicable to the higher alloy materials.

It is Mr. Merrick's belief that precision casting offers possibilities for the future in the production of dies for the die casting and plastics industries.

Die Castings Reach New Limits

Speaking on "Die Casting," Mr. Tour designated it as an old established casting method that has reached new limits during this war. It is economical in the quantity production of castings of intricate shape requiring a high degree of dimensional accuracy. Die castings come from the die with a surface finish that usually permits their use directly with no machining or polishing operations. Electroplated finishes can be applied directly. Cost of the dies is usually high, but this high initial cost is more than offset by savings in the machining and finishing of the castings.

Other advantages of die casting, as enumerated by Mr. Tour, are the high production casting rates, ranging from several hundred per hour to several hundred per minute, high dimensional accuracy, and ability to cast intricate shapes. At times, assembly costs can be reduced by the use of inserts of other metals.

Following the featured talks, a lively discussion was held, led by technical chairman Roger Metzler, during which various other procedures for making precision parts were commented upon by the audience.

A.S.M. REVIEW OF CURRENT METAL LITERATURE

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month. Prepared by Thelma Reinberg, Librarian.

1. ORES & RAW MATERIALS

Production; Mining; Beneficiation

1-19. **Design and Operation of Modern Sintering Plants.** C. J. Duby. *Iron & Steel Engineer*, v. 22, May '45, pp. 39-44, 61.

Sintering is not an innovation, the process received great impetus in recent years as a means of increasing blast furnace production . . . the design of the new plants shows many improvements, particularly in the material handling facilities.

1-20. **New Use Patterns Required for Survival of Wartime Metallurgical Innovations.** R. S. Dean. *Mining & Metallurgy*, v. 26, June '45, pp. 289-291.

Trend to exhaustion of our high grade ores may not necessarily require dependence upon imports from other countries to meet our deficiencies. Present technology and use-patterns have been developed for treatment of high grade ores. We should try to devise, far in advance of urgent needs, other technologies and use-patterns that utilize such ores as we actually have.

1-21. **Postwar Prospects for Fluorspar Are Bright.** William H. Waggaman and Oliver C. Ralston. *Mining & Metallurgy*, v. 26, June '45, pp. 295-299.

New uses for fluorspar derivatives have been developed, including use of hydrofluoric acid in the manufacture of high-octane gasoline, and of freon as a refrigerant and component of insecticides. To meet expanded requirements, ore reserves are none too large.

1-22. **Principles of Comminution—Size and Surface Distribution.** A. M. Gaudin and S. Suphi Yavasca. *Mining Technology*, v. 9, May '45, T.P. 1819.

Summarized comparison of experimental values for surface factors for various mineral substances at various sizes. Results described show that in the fine sizes the new surface per grade is independent of size whether the solid be crystalline or glassy, cleavable or not, soft or hard. 4 ref.

1-23. **Short-Rod Grinding in Ball Mills.** H. R. Stahl. *Mining Technology*, v. 9, May '45, T.P. 1821.

Concentration practice has attempted to carry size reduction to a point where economic unlocking of the galena is obtained, without causing undue sliming of the very friable galena.

1-24. **Determination of Ball-Mill Size from Grindability Data.** Stanley D. Michaelson. *Mining Technology*, v. 9, May '45, T.P. 1844.

Method to determine mill size with a reasonable degree of accuracy. Selection of the proper size and type of mill made on an empirical basis. 4 ref.

1-25. **Development in Bismuth Recovery.** A. G. Arend. *Industrial Chemist*, v. 21, Apr. '45, pp. 199-202.

By-product sources; scrap brasses; concentration and refining; elimination of lead; electrolytic refining; make-up.

1-26. **The Treatment of Gold Ores.** F. B. Michell. *Mine & Quarry Engineering*, v. 10, May '45, pp. 107-115.

Introduction, general principles, grinding gold ores, plate amalgamation, amalgamation of concentrates, application and practice of flotation, cyanidation and precipitation, treatment of simple or free-milling ores, placers, and simple sulphide ores.

1-27. **How Basic Magnesium Improved Its Pelletizing.** Fred D. Gibson. *Engineering and Mining Journal*, v. 146, June '45, pp. 84-86.

Basic Magnesium, Inc., began life as a high-cost producer, but by the time the accumulated stockpile of magnesium had forced the government to close the plant in December, 1944, operating costs had been brought down to a competitive level. Among the most effective cost-cutting improvements were the changes made in preparation and handling of raw material.

2. SMELTING AND REFINING

2-67. **New Developments in Aluminum and Magnesium Furnace Design and Melting Practices.** Arthur D. Wilcox. *Industrial Gas*, v. 23, May '45, pp. 9-12, 27-28.

Information on the general procedures of the various melting methods and to indicate the problems involved in melting aluminum and magnesium with gas.

2-68. **Melt Control, Its Evolution and the Effect of a Current Control Method on Basic Open Hearth Operations.** A. M. Kroner. *Blast Furnace & Steel Plant*, v. 33, May '45 pp. 561-567.

Early melt control practice; hot metal mixers; early high metal practice; calculated correction for hot metal silicon analysis; iron-scrap ratio control; development of current practice; results of current practice.

2-69. **Influence of Melting Conditions on the Physical Properties of Steel Castings.** H. T. Protheroe. Paper presented to the Iron & Steel Institute, London, August '44, *Engineers' Digest* (American Edition), v. 2, May '45, pp. 248-249.

Factors which have the most decided influence upon the mechanical properties of the final product. Four groups of cast steels with carbon contents of (1) below 0.2%, (2) 0.2 to 0.23%, (3) 0.24 to 0.26%, and (4) over 0.26% were investigated.

2-70. **The Movement of Slag Particles in Liquid Steel.** F. Hartmann. *Stahl und Eisen*, v. 65, Jan. 18, '45, pp. 29-36. Iron and Steel Institute *Bulletin*, no. 112, April '45, pp. 149-A-150-A.

2-71. **The Constitution of Basic Steel Furnace Slags.** J. R. Rait and H. J. Goldschmidt. Iron & Steel Institute, Advance Copy, April '45, 68 pp.

Systems of phase assemblages were deduced from the available phase-diagram data for basic electric reducing and oxidizing slags and basic open-hearth slags. Constitutions of these slags were calculated and compared with the constitutions determined by the X-ray powder method. Agreement between the theoretical and observed results indicates that the systems of phase assemblages are essentially correct. 62 ref.

Materials Index

THE FOLLOWING tabulation classifies the articles annotated in the A.S.M. Review of Current Metal Literature according to the metal or alloy concerned. The articles are designated by section and number. The section number appears in bold face type and the number of the article in light face.

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3-90-92-93; **7**-100-103-108-115-116-120-128; **8**-67-71-81; **16**-59; **19**-176; **20**-218-230; **26**-96-99.

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1-25-26; **3**-88-101-105-106; **8**-67-70-74-75-80-84; **18**-136; **22**-331; **23**-130-131-147-149.

2-72. **A Study of the Basic Open-Hearth Process, With Particular Reference to Slag Constitution.** A. H. Jay. Iron & Steel Institute, Advance Copy, April '45, 32 pp.

Experiments carried out to investigate the constitution of basic open-hearth slags in relation to the mechanism of dephosphorization in the furnace and rephosphorization in the casting pit. Work involved X-ray examination and chemical analysis of slag samples taken during the refining period and the casting of the ingots.

2-73. **The Phosphorus Reaction in Basic Open-Hearth Practice.** Y. K. Zea. Iron & Steel Institute. Advance Copy, April '45, 46 pp.

Practical applications of the equations for calculating the phosphorus content of the metal on the basis of the slag composition and the bath temperature, established by four investigators, are examined in relation to new temperature data and slag and metal analyses obtained from fifteen casts of basic open-hearth steel. It is found that Schenck and Riess's method gives the best results. Results show that rephosphorization during casting is due to a change in the composition of the slag by enrichment of the silica content resulting from its reaction with the fireclay lining of the ladle. 31 ref.

2-74. **Magnesium Technology.** *Chemical Industries*, v. 56, June '45, pp. 978, 980, 1057.

Resume of magnesium production methods that have been used commercially during the present war.

2-75. **Magnesium Fluxes.** A. W. Brace. *Metal Industry*, v. 66, May 4, '45, pp 274-275.

Magnesium is invariably melted under a flux, and these fluxes always contain magnesium chloride. Reasons for this given and the mechanism of their action further discussed, with special reference to some patented compositions. 9 ref.

2-76. **Electric Steel.** *Iron and Steel*, v. 18, May '45, pp. 156-157.

Methods and equipment for furnace charging.

2-77. **Establishing Basic Open Hearth Practice for Optimum Chromium Practice.** R. G. Waite. *Blast Furnace & Steel Plant*, v. 33, June '45, pp. 708-711.

The variables and other theories which affect the melting loss of chromium and the recovery of chromium from the furnace additions are: Chromium content of the slag prior to ferrochrome addition; degree of deoxidation; basicity of the slag before FeCr addition; time for chromium distribution between slag and bath; point of addition of FeCr in the furnace log; preheat of ferrochrome; amount of carbon, manganese, and alloy in the bath at point of ferrochrome addition. 2 ref.

3. PROPERTIES OF METALS AND ALLOYS

3-87. **Copper and Copper-Base Alloys.** J. W. Donaldson. *Metal Industry*, v. 66, April 27, '45, pp. 258-260.

Effect of various elements on the mechanical properties and dezincification of manganese bronze, and summarizes various researches on corrosion. Continuous and centrifugal casting mentioned. 13 ref.

3-88. **Beryllium—the Light Metal.** Z. J. Atlee. *Modern Metals*, v. 1, April '45, pp. 7-8.

Beryllium used for new applications in increasing amounts since entry into the war. General outline of the metal, its properties and alloys. 5 ref.

3-89. **High Strength Cast Irons.** *Metals and Alloys*, v. 21, May '45, pp. 1355, 1357.

Compositions of typical high strength cast irons; physical properties of some of the high strength cast irons.

3-90. **Alloying Magnesium.** G. Eldridge Stedman. *Steel*, v. 116, May 21, '45, pp. 130, 133, 164, 166, 168, 170.

Great strength, durability and ductility are imparted by addition of zinc, aluminum and manganese. Flux introduced on surface of metal during meltdown prevents burning. Special gates and risers are required.

3-91. **Combatting Microshrinkage in Casting Magnesium.** Robert Van Brunt. *Aluminum & Magnesium*, v. 1, May '45, pp. 28-29, 34.

New Mg-Mn-Al-Zn alloy with lower susceptibility to microshrinkage, and better flowability and casting characteristics.

3-92. **Creep Strength of Zinc and Zinc Alloy Sheets.** *Zeitschrift für Metallkunde*, v. 26, Feb. '44, pp. 43-45.

3-93. **The Effect of Ferrous Metal Additions on the Properties of Zinc.** Franz Pawlek. *Zeitschrift für Metallkunde*, v. 36, May '44, pp. 105-111.

3-94. **Permeability Measurements on 0.1 to 0.01-Cm. Thick Ni-Fe Strip.** Gunther Rassman. *Zeitschrift fur Metallkunde*, v. 36, June '44, pp. 131-135.

3-95. **Formation of Oxide Layers on Different Nickel Alloys.** Lore Horn. *Zeitschrift für Metallkunde*, v. 36, June '44, pp. 142-145.

3-96. **Influence of Small Additions of Thorium on the Life of Heat-Conducting Alloys.** Werner Hessenbruch and Lore Horn. *Zeitschrift für Metallkunde*, v. 36, June '44, pp. 145-146.

3-97. **Cast and Forged Steels Compared.** C. E. Sims. *Steel*, v. 116, June 4, '45, pp. 113-114, 116, 152, 154.

After making comparative study of physical properties of the two materials, Battelle Memorial Institute researchers conclude there is little to choose between forged and soundly cast steel parts. Limited forging of cast blanks sometimes effective.

3-98. **Recent Developments in Copper-Base Alloys.** Arthur L. Clark. *Iron Age*, v. 155, June 7, '45, pp. 64-68.

Advances in metallurgy, melting practice and rolling have resulted in superior bronzes of the aluminum, silicon and phosphor types. Particularly where high strength, resistance to fatigue and corrosion resistance are factors, the advantages of these copper-base alloys outweigh their higher cost and make dependability in a given application the governing factor.

3-99. **Progress Report on Graphitization of Steam Lines.** S. L. Hoyt and R. D. Williams. *Welding Journal*, v. 24, May '45, pp. 274s-282s.

Weld prober samples were removed at and adjacent to the welded joints and examined for graphite and tested for ductility. With data on materials, welding conditions and service history, work has contributed substantially to the basic understanding of the problem and has been of great assistance to the research work which is being done. 8 ref.

3-100. **A Note on the Physical Properties of an Austenitic Weld Metal and Its Structural Transformation on Straining.** K. Winterton. *Welding Journal*, v. 24, May '45, pp. 308s-310s.

Mechanical tests at elevated temperatures on composite 18-8 weld-plate tensile specimens, showed that the tensile strength, yield strength, and hardness declined with increased testing temperatures. Effect of prior heat treatment at 850° C. in causing increased tensile strength, and decreased yield strength, decreased with testing temperature and was not apparent above 150° C. Microscopic examination showed a breakdown of dendritic regions to a light-etching α-constituent, and the formation of lines and blocks of a deep-etching α-constituent, probably due to uneven straining. 3 ref.

3-101. **Tantalum: Past History and Present Uses.** M. Schofield. *Industrial Chemist*, v. 21, April '45, pp. 207-209.

Battery charger; extraction; properties; applications. 6 ref.

3-102. **Segregation in Babbitt.** American Society of Naval Engineers *Journal*, v. 57, May '45, pp. 241-248.

Segregation in babbitt, and its effect on the final cast structure. Each composition exhibits certain specific types of segregation and two compositions of babbitt are presented — a tin base and a lead base. Bearings usually are cast either statically or centrifugally; therefore the effect of these two methods on segregation is presented.

3-103. **Distribution of Mechanical Properties in Sand Cast Bronzes.** R. H. Brouk, R. G. Hardy, and B. M. Loring. *American Foundryman*, v. 7, June '45, pp. 61-66.

Effect of composition on the variations in mechanical properties in a heavy bronze casting. Corresponding locations studied with respect to microstructure, grain size, specific gravity, chemical composition and mechanical properties. 5 ref.

3-104. **Die and Hobbing Steels for Plastics Molds.** Ray P. Kells. *Modern Plastics*, v. 22, June '45, pp. 130-133.

Requirements of a mold or die material are: It must be clean and free from porosity; it must not deform in hardening; it must harden to a relatively high hardness and to a depth sufficient to resist sinking under high pressures; it must in many cases be able to resist the abrasive action of plastics; when corrosive plastics are used, the die material must resist this action; must meet all requirements insofar as fabrication of the mold is concerned.

3-105. **Characteristics of the Ag-Cs and Sb-Cs Photoelectric Surfaces.** G. Lewin. Electrochemical Society preprint 87-22, 8 pp.

Characteristics of the S1 (Ag-Cs) and S4 (Sb-Cs) photoelectric surfaces are discussed. Procedures followed in producing these surfaces are outlined. Data on current output, spectral sensitivity, dark current, and fatigue are given. Theoretical considerations of the probable electrochemical action responsible for sensitivity of the S1 surface in the red region are presented.

3-106. **Molybdenum.** W. H. Dennis. *Mine & Quarry Engineering*, v. 10, May '45, pp. 119-123.

Production and uses.

3-107. **Intercrystalline Cracking of Lead.** *Metal Industry*, v. 66, June 1, '45, pp. 345, 348.

Example of a metallurgical "hard case." 7 ref.

3-108. **Standard Malleable Irons—Work Sheet.** *Machine Design*, v. 17, June '45, pp. 149-152.

Characteristics; applications; fabrication; reaming; tapping; milling; localized hardening; resistance to corrosion; protective coatings; design tips.

3-109. **New Uses for Aluminum Alloys.** *Western Miner*, v. 18, June '45, pp. 78, 80, 82.

Development of new alloys; machinability of the aluminum alloys can be increased by the addition of lead and bismuth; small amounts of magnesium added to aluminum alloys increase the corrosion resistance and physical properties of the metal; importance of electro-chemistry in the aluminum industry; new aluminum tin bearing alloy with outstanding properties.

3-110. **Graphitization of Steel.** H. J. Kerr and F. Eberle. *Iron and Steel*, v. 18, May '45, pp. 164-168.

Investigations on low carbon and low carbon molybdenum types. (Presented at a meeting of the American Society of Mechanical Engineers).

3-111. **Effect of Boron on Aluminum Castings.** *Iron Age*, v. 155, June 21, '45, p. 61.

Determines the effects of boron trichloride on an aluminum permanent mold casting alloy. This modifier used in alloy 356, which contains 7% silicon and 0.3% magnesium, serves to refine the grain structure and modify the microporosity from the sharp shrink type to the rounded gas type of cavity, reduces mechanical properties of castings, increases brittleness but does not affect corrosion resistance or heat treatment characteristics of the alloy.

3-112. **Discussion—Graphitization of Low-Carbon and Low-Carbon-Molybdenum Steels.** *Welding Journal*, v. 24, June '45, pp. 350s-359s.

Investigation of graphitization of the high-temperature piping in the Public Service Electric and Gas Co. Stations.

4. STRUCTURE

Metallography and Constitution

4-30. **Recrystallization of Aluminum During Industrial Forming.** K. Kaiser. *Metall Wirtschaft*, v. 22, Nov. 20, '43, pp. 503-507.

4-31. **Gravity and Temperature Liquation in Liquid Two-Component Alloys.** Josef Rief. *Zeitschrift für Metallkunde*, v. 26, Feb. '44, pp. 25-37.

4-32. **Relaxation of Polycrystalline Aluminum and Copper Wire.** George Masing and Ruth Bandler. *Zeitschrift für Metallkunde*, v. 36, May '44, pp. 113-114.

4-33. **X-Ray Determination of Tensile and Compressive Stresses in Brass and in Aluminum-Copper-Magnesium Alloy.** Victor Hauk. *Zeitschrift für Metallkunde*, v. 36, May '44, pp. 120-123.

4-34. **Formation of Martensite in Iron-Nickel-Cobalt Alloys.** K. Schichtel and Ursula Wilke-Dörfurt. *Zeitschrift fur Metallkunde*, v. 36, June '44, pp. 147-148.

4-35. **Study of Plastic Deformation of Metals. Part II.** James L. Erickson. *Light Metal Age*, v. 3, May '45, pp. 19, 34.

Mechanism of plastic deformation of metallic crystal aggregates discussed.

4-36. **X-Ray Diffraction II.** F. G. Firth. *Petroleum Refiner*, v. 24, May '45, pp. 117-119.

Constitution of matter

4-37. **Controlling Grain Size in No. 142 Aluminum Alloys.** G. J. Beckwith. *Modern Metals*, v. 1, June '45, pp. 20-21, 23.

Specific methods for controlling grain size in aluminum alloy castings having either thin or heavy sections. Various materials used to insure quality castings such as mold spray, chlorination, metal and casting temperatures, as well as additions of small amounts of alloying ingredients.

4-38. **The Magnetic Properties and the Constitutional Diagram of Iron-Cobalt Alloys.** M. Fallot. *Metaux, Corrosion-Usure*, v. 18, Dec. '43, pp. 214-219. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 157-A.

4-39. **The Variation in the Volume of Alloys in the Heterogeneous Region Liquidus-Solidus III.** F. Sauerwald. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 543-545.

4-40. **The Solubility of Bismuth in Magnesium.** H. Voss Kuhler. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 545-547.

5. POWDER METALLURGY

5-21. **Metal Powders.** *Steel*, v. 116, May 28, '45, p. 114.

Produced by fused salt electrolysis for powder-metal compacts. About 20 different metals have been deposited as small crystals or dendrites by this method.

5-22. **Copper and Copper-Base Alloys.** J. W. Donaldson. *Metal Industry*, v. 66, May 4, '45, pp. 281-282.

Deals with the preparation of copper and its alloys by powder metallurgy processes. Brief reference is also made to the machinability of copper alloys and to modern methods of welding these materials. A review of American investigations and researches during 1944. 12 ref.

5-23. **A Rapid Optical Method for Estimating the Specific Surface of Powders.** E. Sharratt, E. H. S. Van Someren and E. C. Rollason. Society of Chemical Industry *Journal*, v. 64, March '45, pp. 73-75.

Estimating surface areas from an observation of the optical density of their dilute suspensions. Gives satisfactory results directly with opaque powders lying within the 2.5-150μ range principally. Transparent powders give low results, but the method is of some value as a means of comparison.

5-24. **Powdered Iron Cores.** C. T. Martowicz. *Electronic Industries*, v. 4, June '45, pp. 108-110.

Design factors that influence realization of the superior electrical characteristics of iron cored coils.

5-25. **Sintered Metals.** R. Kieffer and W. Hotop. *Metal Industry*, v. 66, June 1, '45, pp. 342-344.

It is frequently thought that it is only necessary to apply sufficient pressure to a metal powder to produce a metal equivalent in properties to a fused product. That this is not so is shown. Properties of the finished sinters. (Translated from *Kolloid Zeitschrift*, Aug.-Sept. '43.) 11 ref.

6. CORROSION

6-58. **An Investigation into Corrosion Caused by Aromatic Benzole Absorption Oil—**III. O. B. Wilson. *Coke & Smokeless-Fuel Age*, v. 7, April '45, pp. 73-77.

Composition and corrosion of iron; metallurgy of cast iron; plant experience; coating with a metal layer.

6-59. **Season or Stress-Corrosion Cracking—I.** *Metal Industry*, v. 66, April 27, '45, pp. 265, 268.

Nomenclature. 5 ref.

6-60. **External Corrosion of Furnace-Wall Tubes—I. History and Occurrence.** W. T. Reid, R. C. Corey, and B. J. Cross. American Society of Mechanical Engineers *Transactions*, v. 67, May '45, pp. 279-288.

Occurrence of external corrosion, 16 furnaces in 13 stations being examined. Corrosion was found to occur when the temperature of the tube metal was in the normal range for boiler furnaces, usually not exceeding 700° F, while the maximum temperatures observed were less than 900° F. Deposits in corrosion areas are shown to be of two types, one having the appearance of a bluish-white porcelain enamel, being largely soluble in water in which it produces an acid reaction, and consisting principally of sodium and potassium sulphates in a complex form. The second type is iridescent blue or black, is insoluble in water, may contain significant amounts of carbon, and consists primarily of iron sulphide. Because of the greater incidence of the sulphate deposit, its study was made first and is reported in detail.

6-61. **External Corrision of Furnace-Wall Tubes—II. Significance of Sulphate Deposits and Sulphur Trioxide in Corrosion Mechanism.** R. C. Corey, B. J. Cross, and W. T. Reid. American Society of Mechanical Engineers *Transactions*, v. 67, May '45, pp. 289-302.

Objectives of the investigation were: To determine the factors involved in corrosion associated with enamel deposits; to determine the mechanism of corrosion; to reproduce this type of corrosion under controlled laboratory conditions; to devise means for retarding the rate of corrosion to a negligible rate, or arresting it completely, in operating furnaces.

6-62. **Chemical Corrosion of Some Remelted Aluminum Alloys.** Lilli Reschke. *Metall Wirtschaft*, v. 22, Nov. 20, '43, pp. 507-517.

6-63. **Chemical Corrosion of Standardized Sand and Chill-Cast Alloys (Short-Time Test in NaCl-H_2O_2 Solution.).** R. Sterner Rainer. *Metall Wirtschaft*, v. 22, Nov. 20, '43, pp. 517-522.

Corrosion behavior of a series of aluminum alloys tested in a 1% solution of common salt with 3% hydrogen peroxide added on heat treated materials (rough, ground, or polished). The "Eloxal" or "MBV" coating improved the resistance of most of the alloys.

6-64. **Laboratory Corrosion Tests.** R. M. Burns. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, May '45, pp. 299-302.

Critical review of laboratory corrosion tests, with description of methods of measurement, preparation of test specimens, and discussion of tests and testing facilities. 20 ref.

6-65. **Sea-Air Corrosion of Magnesium Alloys.** J. A. Peloubet. *Metals and Alloys*, v. 21, May '45, pp. 1327-1333.

Magnesium alloys are shown by cooperative coastal exposure tests to be surprisingly resistant, and in some cases to be actually among the best of the materials tested. Data on the relative merits in this respect of several magnesium alloys, aluminum alloys, mild steel and galvanized iron will correct some prevalent impressions of the relative corrodibility of magnesium alloys.

6-66. **Stress-Corrosion Cracking.** *Corrosion and Material Protection*, v. 2, May '45, pp. 17-24.

A correlated abstract. Mechanism of stress-corrosion cracking; tests for stress-corrosion cracking; cartridge brass; aluminum; miscellaneous alloys; aircraft; bridge cable; high nickel alloys; austenitic stainless steels; lead-antimony alloys. (From American Society for Testing Materials and the American Institute of Mining and Metallurgical Engineers Symposium.) 29 ref.

6-67. **Salt Water Corrosion on Plated and Unplated Stainless.** C. J. Strid. *Product Engineering*, v. 16, June '45, pp. 398-399.

With plain chromium corrosion resistant steel parts, a cadmium plate was generally specified for service in salt water atmospheres. Experiments on corrosion resistant 416 and 440 indicate that the cadmium coating may safely be omitted. Corrosion effects produced by salt water discussed.

6-68. **Report on Stress Corrosion Cracking of Boiler Plate Steel.** James T. Waber, Hugh J. McDonald, and Bruce Longtin. *Welding Journal*, v. 24, May '45, pp. 268s-273s.

Testing methods suitable for producing cracking; influence of such variables as heat treatment, stress level, chemical analysis of the steels, composition and acidity of the corroding solution; mechanism of stress corrosion cracking. 12 ref.

6-69. **Emulsions of Oil in Water as Corrosion Inhibitors.** P. Hamer, L. Powell and E. W. Colbeck. *Metallurgia*, v. 31, April '45, pp. 291-293.

Preventing corrosion in recirculating cooling systems. Attention has been chiefly directed to the prevention of attack on mild steel. Three types of water have been used under both static and flow conditions at room temperature, and at 60 and 90° C.

6-70. **Stainless Steels Minimize Corrosion in Processing Sour Crude Oils.** R. B. Tuttle. *Oil & Gas Journal*, v. 44, June 16, '45, pp. 104-106.

Findings show that metal losses in equipment increase to a maximum at the heavy gas-oil cracker. A loss of 25% in six months was found in the 4 to 6% Cr condensate line of the vapor separator.

6-71. **Abstracts From a Symposium on the Stress Corrosion of Metals and Alloys.** *Sheet Metal Industries*, v. 21, May '45, pp. 810-816.

A generalized theory of stress corrosion of alloys, by R. B. Mears, R. H. Brown, and E. H. Dix, Jr. The mechanism of the season cracking of brass, by H. Rosenthal. Residual stress in calibre 0.30 cartridge brass, by H. Rosenthal and J. Mazia. The assessment of the susceptibility of aluminum alloys to stress corrosion, by F. A. Champion. Elevated temperature tension tests on galvanized steels, by J. H. Craig. Stress-corrosion cracking of nickel and some nickel alloys, by O. B. J. Fraser. Some observations on stress-corrosion cracking in austenitic stainless alloys, by M. A. Scheil. Stress corrosion testing of magnesium alloys by W. S. Loose and H. A. Barbian. Protective resin films on cartridge brass, by H. Gisser. 26 ref.

6-72. **Diagnostic Methods in Problems Concerned with the Corrosion of Food Cans.** W. B. Adam and D. Dickinson. *Sheet Metal Industries*, v. 21, May '45, pp. 824-826.

Method of sampling; factors investigated; can factors; contents factors.

6-73. **The Effect of the Iron Content of Cupro-Nickel on Its Corrosion Resistance in "Sea Water."** A. W. Tracy and R. L. Hungerford. American Society for Testing Materials, preprint A2, 1945, 22 pp.

Data on a laboratory investigation concerning the effect of iron additions to cupro-nickels on the corrosion resistance of the alloys exposed to sea water in motion. The "sea water" was a 3% solution of sea salt. Sheet metal specimens were tested by attaching to fiber disks which were rotated in the test solution and tube specimens were placed in an experimental condenser. The extent of corrosion was determined on sheet metal specimens by measuring losses in thickness by means of sharp-pointed micrometers. Corrosion of tube specimens was judged from visual examinations.

6-74. **Electrolytic Corrosion—Methods of Evaluating Insulating Materials Used in Tropical Service.** B. H. Thompson and K. N. Mathes. *Electrical Engineering*, v. 64, June '45, pp. 295-299.

Selection of insulating materials to guard against electrolytic corrosion has become increasingly important as the use of electric devices in the tropics has increased. Moisture conditions in the tropics are described, and means for producing such conditions in the laboratory are considered. The visual, corrosion-current, and water-extract conductivity methods for studying electrolytic corrosion are described. 2 ref.

6-75. **Season- or Stress-Corrosion Cracking, II.** *Metal Industry*, v. 66, May 11, '45, p. 297.

Base mechanisms; ammonia cracking; grain boundary effects; brass; cartridge cases; electrochemical relationships.

6-76. **Corrosion and Biofouling of Copper-Base Alloys in Sea Water.** C. L. Bulow. Electrochemical Society, Preprint 87-26, 32 pp.

Copper alloys, of widely varied composition, were exposed to clean flowing sea water during which the water temperature ranged between 2 and 30° C. All of the specimens were covered with a slime after a few months' exposure. Some of the specimens showed excessive biofouling by relatively large marine flora and fauna. Alloys that were not biofouled to any extent showed marked increase in biofouling upon the addition of small percentages of aluminum, arsenic, and iron. Small additions of aluminum to certain copper alloys increased the resistance to impingement corrosion. Slight modifications of these alloys by the addition or subtraction of minor constituents of the alloys will, in many cases, greatly affect their corrosion resistance to clean flowing sea water.

6-77. **Scale-Forming and Corrosive Tendencies of Water Predicted by Rapid Methods.** Joe R. Wright. *Oil & Gas Journal*, v. 44, June 23, '45, pp. 99-100, 104, 107.

Previous methods of testing water and predicting corrosive or scale-forming tendencies have been criticized in that they are time consuming, expensive, and inexact. Method described has been shortened and simplified. Results are dependable because they have an exact mathematical basis. 13 ref.

The Metals REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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Ray T. Bayless.......................................*Editor*
M. R. Hyslop.................................*Managing Editor*

Cleveland, Ohio—July, 1945
Volume XVIII Number 7

Compliments

To PROF. ALBERT M. PORTEVIN of France on his installation as a member of the Academie des Sciences on June 20, 1943.

\- * -

To OWEN W. ELLIS, director of the engineering and metallurgical department of the Ontario Research Foundation, on his election as chairman of the metallurgy division of the Canadian Institute of Mining and Metallurgy.

\- * -

To W. SPRARAGEN, executive secretary of the Welding Research Council of the Engineering Foundation, and editor and business manager of the *Welding Journal*, on his appointment to the newly created position of director of the Welding Research Council.

\- * -

To CLYDE WILLIAMS, director of Battelle Memorial Institute, Columbus, Ohio, on the presentation of the degree of Doctor of Science by Case School of Applied Science.

\- * -

Rhode Island Silver Anniversary Is Portent of Further Profitable Meetings

Reported by Joseph M. Redinger, Jr.
General Manager, Thurston Mfg. Co.

Rhode Island Chapter ASM celebrated its Silver Anniversary on May 16 at the Narragansett Hotel in Providence with a dinner to which all members and friends of the Society were cordially invited.

Laurence E. Wagner, chief industrial engineer of the Providence Gas Co., was toastmaster and Kent R. Van Horn, the national president of the Society, was the principal speaker. His subject, "Applications of the Aluminum Casting and Wrought Alloys," described the chemical compositions, tensile and physical properties, and practical applications of the various aluminum alloys.

W. H. Eisenman, national secretary, was the guest of honor, for it was he who started the Chapter on its way. The 25th anniversary of the Rhode Island Chapter was a portent of many future get-togethers in the advancement of the art of metals and their heat treatment.

G. B. Michie Named Vice-President of Electro Refractories & Alloys Corp.

Announcement of the election of George B. Michie as vice-president in charge of sales has been made by Electro Refractories & Alloys Corp., Buffalo, N. Y. Mr. Michie became connected with Electro Refractories & Alloys in 1931, instituted and had charge of the Alloys Division of the company for ten years. For the past five years Mr. Michie has been in charge of purchasing and priorities for Electro.


G. B. Michie

He is currently chairman of the Buffalo Chapter of the American Society for Metals, and has served for the past year as national director of the Purchasing Agents Association of Buffalo.

New Nitriding Steel Containing Free Graphite Resists Wear Under Lubricated Conditions

Reported by Horace Ross
Henry Disston & Sons, Inc.

A new nitriding steel which contains approximately 1.25% carbon was described by Carl F. Floe, associate professor of physical metallurgy, Massachusetts Institute of Technology, when he addressed the Boston Chapter A.S.M. on April 6.

By a simple heat treatment previous to nitriding, approximately two-thirds of this carbon can be converted to free graphite, Dr. Floe stated. When such a structure is nitrided, a hard, wear resistant case is produced which, however, is rendered porous by the presence of free graphite.

Such a structure is ideal for lubricated wear since it greatly aids in the maintenance of the lubricating film. Dr. Floe predicted that this steel will have wide application for parts such as cylinder liners, bushings, bearings and other applications where high wear resistance under lubricated conditions is particularly important.

In his preliminary remarks the speaker described the mechanism of nitriding, explaining the surface reactions between the steel and ammonia, the mechanism of nitrogen absorption, diffusion of nitrogen and precipitation of alloy nitrides. The structure of typical nitride cases, including factors affecting the depth of white layer, was discussed in detail.

Dr. Floe compared the use of ammonia and salt baths in nitriding, and the various types of nitriding furnaces. Fatigue properties of steels, particularly notch sensitivity, are improved by nitriding, primarily because of the compressive stresses that are set up in the case. The nitriding of stainless, high speed and chromium-containing steels was described briefly.

Following the technical discussion a film entitled "The Iron Men of New England" was shown which illustrated the historical background of old iron foundries, modern blast furnace operation, and present-day foundry practices in the larger shops of New England.


Technical Chairman John Paine (left), metallurgist of United Shoe Machinery Corp., congratulates Prof. Carl Floe of M.I.T. after his excellent discussion of "New Developments in Nitriding" before the Boston Chapter on April 6.

UNFORESEEN and unavoidable delays have been encountered in the publication of two new books by the American Society for Metals—namely, the ASM REVIEW OF CURRENT METAL LITERATURE, VOLUME I, and the revised and enlarged edition of ENGINEERING ALLOYS by Woldman. They should both be ready for distribution by about the first of October.

Etch and Magnaflux Tests To Select Aircraft Forgings

Reported by E. H. Snyder
Austin-Western Co.

Thousands of etch tests and Magnaflux tests are made on billets for quality aircraft forgings, which frequently operate with factors of safety of two or less. These tests, used to eliminate material containing such defects as flakes, porosity, cracks, seams, and inclusions, were described by C. A. Ferguson of Ladish Drop Forge Co., speaking before the Chicago Chapter on April 12 on "The Cause and Prevention of Failures in Forgings."

Cooling rates are carefully controlled to prevent internal bursts, Mr. Ferguson said. As far as possible, forgings are designed with uniform sections and large fillets.

Several slides showed fatigue failures which had started in sharp edged oil holes, sharp fillets, and unauthorized welds, and other repairs made by machine shops for correcting machining errors.

An unusual feature of the April meeting was a game in which 60 numbered slides were flashed on the screen for 20 sec. each. Each slide was an advertisement of a sustaining member of the Chicago Chapter with the name deleted. Each person present was given a list of the 60 names and tried to identify the numbered slides with this list of names. Ray Mau won the $25 first prize with 56 correct answers.

Reynolds Metals Opens Mexican Plant

Reynolds Metals Co. has announced the establishment of a plant in Mexico for the production of aluminum sheet and plate, to be known as Reynolds Internacionale de Mexico. Other fields of aluminum fabrication, such as forgings, extrusions and bars are contemplated for the future. The company will be headed by R. S. Reynolds as chairman of the board and J. Louis Reynolds as president.

Tool Failures Attributed To Shortcomings in Design

Reported by H. L. Millar
Metallurgist, Plomb Tool Co.

Speaking before the April meeting of the Los Angeles Chapter on "Practical Heat Treating of Tool Steel and Its Relation to Design," Howard J. Stagg of the Crucible Steel Co. of America, attributed the cause of most tool and die failures to a lack of attention to details of design and ignorance of certain pertinent facts concerning the behavior of steel under the influence of heat.

By means of pictures and diagrams the speaker showed many types of failures in tools and dies and demonstrated the relation of design to the concentration of stress at the points of weakness. Notches, nicks, fins, oil holes, sharp angles, abrupt changes of section, inclusions, pits, and stamp marks were cited as the most common stress-raisers which should be avoided by the tool designer. Dies fashioned without consideration for these defects are most certainly destined for premature failure regardless of the care they might receive in heat treatment.

Imposing installations of equipment and control instruments may be necessary for successful heat treating, according to Mr. Stagg, but the quench tank is still the most important factor in the hardening operation.

The behavior of a piece of steel undergoing heat treatment was followed on a curve as it expanded on being heated and contracted on being cooled. As the cooling continued, however, the steel expanded again at an accelerated rate. This change occurs at 350 to 400° F., which is now designated as the Ms point, where transformation of austensite to martensite occurs.

Chief among tool steels which have been improved during the period of national emergency is molybdenum high speed steel. This new steel designated as M-2 is comparable to regular high speed steel in response to heat treatment but is superior in performance. The speaker emphasized the fact that maximum performance is not attained in any high speed steel unless it is given the double-draw treatment.

Controlled Atmospheres as Applied To Specific Tool Steels Discussed

Reported by H. P. Henderson
Production Engineer, New Departure Div., G.M.C.

A subject of vital importance in the metallurgical field, "Controlled Atmospheres," was covered by Norbert K. Koebel, director of research for the Lindberg Engineering Co. at the May meeting of the Hartford Chapter.

The speaker's talk dealt with the requirements for successful results in heat treating by the use of controlled atmospheres, the importance of proper furnace design, methods of producing correct atmospheres and the application to specific tool steels of varying specifications.

Such advantages as carbon correction to prevent decarburization, the elimination of many expensive cleaning operations and the chance for better quenching conditions because of the absence of scale as quenched were pointed out by Mr. Koebel.

Metal Literature Review—*Continued*

7. CLEANING AND FINISHING

7-87. **Surface Finish.** *Automobile Engineer,* v. 35, April '45, pp. 141-146.
Survey of the practical aspects of present-day knowledge.

7-88. **Cleaning Forgings for Magnaflux Inspection.** E. H. Johnston. *Steel,* v. 116, May 21, '45, p. 111.
Cleaning method which provides a surface free of scale, and one which has a clear, bright surface upon which the red or black Magnaflux powders stand clearly in relief.

7-89. **Evaluation of Metal Decorating Coatings.** W. F. Holland. *Organic Finishing,* v. 6, May '45, pp. 9-10, 12-16.
Evaluation coatings; application; testing; processing; chemical tests; trends. 2 ref.

7-90. **Luminous and Fluorescent Paints.** *Organic Finishing,* v. 6, May '45, pp. 19-21, 24.
Letter Circular 703, National Bureau of Standards. General information regarding luminous and fluorescent paints.

7-91. **Electrostatic Spraying and Detearing.** Sanford Markey. *Organic Finishing,* v. 6, May '45, pp. 37-41.
Electrostatic spraying and detearing allow faster, better and more economical finishing. Discusses the process in general.

7-92. **How to Prevent Corrosion Under Paint.** Ray Sanders. *Corrosion and Material Protection,* v. 2, May '45, pp. 15-16, 24.
Solution to the problem of corrosion beneath applied coatings consists in the application of a phosphatizing treatment after cleaning and immediately prior to painting.

7-93. **How to Select a Rust Preventive.** J. R. C. Boyer. *Corrosion and Material Protection,* v. 2, May '45, pp. 7-9.
Oils and greases intended as rust-protective coatings must be inhibited. Selection of the proper type of preservative begins with the inhibitor. Theory behind inhibition of oils and greases. To sum up the objects of a treatment, whether inhibitive or special-purpose additive, the purposes are: To increase wetting speed of the finished product; to inhibit oxidation of the film which in itself would increase the danger of corrosion; to increase film strength of the product; to increase adhesion characteristics; to enhance lubricating qualities where required.

7-94. **Lead Coated Steels Appraised.** *Iron Age,* v. 155, May 24, '45, pp. 56-57.
Virtues and limitations of lead coatings on steel, and the possibilities of substituting them for terne and galvanized materials. An efficient method of stripping lead and lead-alloy coatings.

7-95. **Polishing Jacks Can Be Converted to Efficient Belt Grinders.** Rupert Le Grand. *American Machinist,* v. 89, May 24, '45, pp. 103-105.
Inexpensive accessories permit better and faster work.

7-96. **Spark-Proofing Powder Tanks.** D. Saponara. *Better Enameling,* v. 16, May '45, pp. 13-14.
With production metallizing, only one-fifth the former amount of bronze is required in the manufacture of powder tanks for 14-in. Naval guns. Other wartime advantages include release of critical machine tool facilities.

7-97. **Black Finishes for Steel.** H. Silman. Electro-depositors' Technical Society *Journal.* Preprint, v. 20, 1945, pp. 77-92.
Requirements and types of black finishes. Temper colors; caustic alkali-nitrate processes; temperature; two-tank process; additives; characteristics of black oxide coatings; phosphate coatings; Coslett's process; Coslett's zinc solution; accelerators; method of operation; effect of temperature; cleaning; impregnation; black nickel plating; molybdenum-nickel deposits. 5 ref.

7-98. **Large-Volume Degreasing.** *Western Metals,* v. 3, May '45, pp. 24-27.
Automatic operation made fire-safe by carbon dioxide.

7-99. **Blackened Stainless Steels.** Perry B. Strassburger. *Metals and Alloys,* v. 21, May '45, pp. 1307-1312.
Strong, tough and black metal that is at the same time corrosion resistant throughout its section. Nature and characteristics of the material and outlines present and potential applications.

7-100. **Eliminating the Old Steel Hot Plate Dryer, 3.** Wallace G. Imhoff. *Products Finishing,* v. 9, June '45, pp. 48-50, 52, 54, 56.
Function of the liquid flux technique in hot-dip galvanizing is discussed in detail, including equipment required.

7-101. **Some Observations on the Structure of Acid-Resistant Vitreous Enamels for Chemical Plant.** G. E. Charlish and E. J. Heeley. *Foundry Trade Journal,* v. 75, April 12, '45, pp. 303-305.
A standard test needed; enamel capable of replacing rubber; vigorous research work; improved design needed; differential expansion; instructing the foundries.

7-102. **Analysis of Hydrofluoric-Nitric Acid Stainless Steel Pickling Bath.** William E. McKee and William F. Hamilton. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, May '45, pp. 310-312.
Economical and efficient operation of the hydrofluoric-nitric acid stainless steel pickling bath requires control by chemical analysis. Rapid quantitative analytical procedures are presented for the analysis of the bath. They include the determination of total acidity, iron, fluoride, and nitrate. 9 ref.

7-103. **Anode Polishing.** F. C. Mathers and R. E. Ricks. Indiana Academy of Sciences *Proceedings,* v. 53, 1943, pp. 130-133. British Aluminum Company *Light Metals Bulletin,* v. 9, May 18, '45, pp. 134-135.

7-104. **Specifying Rust Preventives.** J. Albin. *Iron Age,* v. 155, June 7, '45, pp. 52-59.
Preliminary step to correlate and classify pertoleum-base rust prevention products suitable for general industrial purposes. Tables compiled to help in the selection of the product appropriate for the protection of the part or machine under specific conditions.

7-105. **Electrostatic Spraying of Porcelain Enamels.** James B. Willis. *Finish,* v. 2, June '45, pp. 21-24, 50.
Detailed report of an investigation of a new method for enamel application.

7-106. **Surface Finishes for Aluminum.** W. L. Maucher and C. B. Gleason. *General Electric Review,* v. 48, June '45, pp. 26-30.
Features, functions, and effects of electrical and chemical processes for treating surfaces of aluminum and its alloys.

7-107. **New Tool Treatment Increases Productivity.** *Production Equipment and Management,* v. 15, June '45, pp. 71-72.
After treatment with "Tough-Ite" process; cutting tools are credited with 100% greater productivity between grinds on stainless steel. Substantial savings are indicated on turning operations when processing non-ferrous metals.

7-108. **Flux Reaction During Hot-Dip Galvanizing.** H. Boblik, F. Gotzl, and R. Kukaczka. *Metall Wirtschaft,* v. 22, Oct. 20, '43, pp. 463-466.

7-109. **Action of Pickling Acid Admixtures.** K. Wickert. *Metall Wirtschaft,* v. 22, Oct. 20, '43, pp. 475-480.

7-110. **Phosphate Surface Treatment and Its Scientific Basis.** W. Machu. *Metall Wirtschaft,* v. 22, Oct. 20, '43, pp. 481-487.

7-111. **The Formation of Metal-Sprayed Deposits.** W. E. Ballard. *Proceedings* of the Physical Society, v. 57, March 1, '45, pp. 67-83.
Difficulties of research on the process examined, these difficulties being increased by the rapidity of the cycle of events in the process of wire spraying. Some difficulties have been overcome by the use of the high-speed cine camera, which has indicated that the spray of metal is rapidly pulsating and that a reaction of the deposited agglomerates of particles takes place on the surface. A theory is put forward to show that surface tension plays a considerable role both in the pulsation of the spray and in the ultimate structure of the coating. Some indications are given that the amount of metal sprayed in unit time is controlled by well-known physical laws, and an empirical formula for speed of working is given. 14 ref.

7-112. **Symposium on Surface Finish.** *Machinery* (London), v. 66, May 10, '45, pp. 514-515.
Locomotive practice, by F. C. Johansen.

7-113. **Lifting and Agitating Mechanism, V.** Edward W. Mulcahy. *Sheet Metal Industries,* v. 21, March '45, pp. 437-442.
Lifting mechanism; pivoting jib crane; the radial pickling machine; acid plungers; reciprocating-conveyor machine; chain agitation for tubes, rods, etc.; coil-pickling machine.

7-114. **Die Castings Can Be Colorful.** *Die Casting,* v. 3, May '45, pp. 42-43, 60.
Beginning of a series showing how die castings can be finished. There is virtually no limitation in color or variety of finishes especially developed for this field.

7-115. **Finishing Telephone Set Housings.** *Die Casting,* v. 3, May '45, pp. 62-63, 65, 80.
Familiar satin-black finish of zinc alloy die cast telephone housings is produced on a mass production basis. Here's how it is done.

7-116. **Vapor Phase Degreasing. Part III.** J. M. Payne. *Die Casting,* v. 3, May '45, pp. 73-74, 76.
Basic principles of vapor phase degreasing, including the class type of solvents used and variations currently incorporated in machine design. Factors which must be considered in selecting the machine type best suited to die castings discussed. Operating hints with a view to securing optimum solvent economy and elimination of health hazards suggested.

7-117. **Fungicide Coatings in War and Peace.** Fred Simmons. *Industrial Finishing,* v. 21, May '45, pp. 72, 74, 79.
Early objections to fungicide coatings by workmen; lacquer and varnish type materials developed; when and how to apply fungus-resistant coatings.

7-118. **Heating Pickling Solutions and Waste Acid Treatment Plant, VII.** Edward Mulcahy. *Sheet Metal Industries,* v. 21, May '45, pp. 799-805, 809.
Heating pickling solutions; waste acid treatment plant.

7-119. **Corrosion Preventives.** J. R. C. Boyer. *Steel,* v. 116, June 11, '45, pp. 128-130, 132, 176, 178.
Wide variety of materials available for preventing the deterioration of metal surfaces Types of coatings, including neutralizers and inhibitors, and their functions and applications discussed.

7-120. **Galvanizing.** W. H. Spowers. *Wire and Wire Products,* v. 20, June '45, pp. 420, 424-427, 451-453.
Principles of zinc coating; pickling; water; flux wash; effect of alloy layers on bonding; galvanizing; formation of zinc dross; centrifugal galvanizing; investigation on use of sulphuric acid for pickling; method of procedure; results.

7-121. **Developments in Wire and Cable Coatings.** Carl Bauer. *Wire and Wire Products,* v. 20, June '45, pp. 428-430.
War developments have established requirements for wire and cable with low temperature flexibility, high heat stability, moisture and fungi resistance, oil and gasoline resistance, together with excellent electrical characteristics. A discussion of coatings to meet such requirements presented.

7-122. **Plastic Coatings Protect Carbide Tipped Tools.** Bernard Gould. *Iron Age,* v. 155, June 14, '45, pp. 66-67.
In addition to protection against corrosion, plastic dip coatings are finding use as a means of cushioning tools and machined parts from chipping and abrasion.

7-123. **Skin Heating.** *Aircraft Production,* v. 7, May '45, pp. 207-209.
Improving surface finish by thermal expansion of light-alloy skin-plating before riveting.

7-124. **Symposium on Surface Finish.** *Machinery* (London), v. 66, April 19, '45, pp. 427-429.
Rational specification of surface finish; requirements in surface finish.

7-125. **Black Finishes for Steel.** H. Silman. *Metal Industry,* v. 66, May 25, '45, pp. 330-332.
Prevention of rusting of steel is a problem that has only been partially solved. Of the methods available, the application of a black finish by oxide or phosphate coatings is described. (Electro-depositors' Technical Society.)

(Continued on Page 9)

Enemy Superiority in Manufacture and Use Of Bronze Is Now Surpassed by Allies

Reported by Herman P. Abel
Metallurgical Laboratory, Delco-Remy Division, G.M.C.

How bronze and copper alloys have played a major part in the present conflict was shown in a talk by Stuart C. Lawson, assistant general sales manager of Ampco Metal, Inc. before the May meeting of the Muncie Chapter. Mr. Lawson prefaced his discussion of "Trends in the Use of Bronze" with a brief history of this very ancient alloy.

The most commonly used bronzes are now classified as follows: Tin bronzes, lead-tin bronzes, and the lead-tin-zinc bronzes (grouped in a class known as the phosphor bronzes), nickel bronze, manganese bronze, silicon bronze, and aluminum bronze.

When the war began, the Japanese and the Germans were far ahead of the Allies in the use and manufacture of bronze. The bronze propellers on their aerial and submarine torpedoes were far superior to anything the Allies possessed. Since then, however, we have made tremendous advances, and the bronze we now use is as good as any manufactured by the enemy.

Ship propellers are generally made of manganese bronze which resists corrosion of salt water and is relatively low in cost. In the repair of such propellers, welding electrodes made of aluminum bronze are now generally used, because the resulting weld is free of porosity, is stronger than the parent metal, and has better resistance to corrosion and cavitation than manganese bronze.

Propellers of landing craft and P-T boats of radically new design have proved very successful. By changing the pitch of the blades, it is possible to reverse direction. Such propellers are subjected to greater loads, and are made from aluminum bronze of higher strength, which has the added advantage of greater resistance to abrasion.

The war has given great impetus to the wider use of centrifugal castings. Advantages over sand casting and forging are greater uniformity and strength, and less impurities because the heavy metals are thrown to the outside by centrifugal force. The outside then chills first and the impurities are forced to the center. Thus, the casting itself is free of impurities. The higher strength and better uniformity are produced by pressure and quick chill. No dendridic structures are present.

Clutch and brake drums made from beryllium-copper were cited as an outstanding example of centrifugal castings. By using the clutch of which these drums are a part, engines of diesel-driven boats can be reversed from full speed ahead to full speed astern in 7 sec.

In conclusion, Mr. Lawson stated that precision castings offer great future possibilities, and predicted that permanent mold castings will become more and more popular, that aluminum and nickel bronzes will be used more where heat is a factor, especially in bearings, and that the iron age is a thing of the past, being outstripped by developments in plastics, bronzes, and the light alloys of aluminum and magnesium. Mr. Lawson presented many interesting lantern slides which explained the technical aspects of his subject.

ASM National Secretary W. H. Eisenman was guest of honor on this occasion, and presented a plaque to Rodney Hayler, a past chairman of the Muncie Chapter.

Help Service Men! Send Hospitals Your Technical Magazines

An ever-growing number of industrial and business magazines are going to military and naval hospitals to help bring disabled veterans back in touch with industry, under a plan announced some time ago by John C. Stephan, national chairman, Committee for Technical Training Rehabilitation of the National Industrial Advertisers' Association.

Plans call for the cooperation of companies and individuals in those companies to send prepaid all currently available file copies of industrial, technical, business and trade periodicals, published in the United States, to men in the service hospitals. This plan will help to bring the veterans' knowledge up-to-date and bridge the gap between their entrance into the service and their re-entry into private life.

It will also place before the younger men who have never been in industry the current information of business and industry and trade vocations to aid them in selecting a vocation or career after release from the armed forces.

Mr. Stephan's committee has as its objective the placement of these magazines in 229 Army Air Force hospitals, in 97 Army Service Force hospitals, 49 Naval hospitals, 95 Veterans' Administration hospitals and in Marine hospitals within the continental United States. This project is already in nation-wide operation—but the cooperation of all companies is urgently needed to obtain sufficient magazines.

It is very simple for you and your company to participate.

Check into the list of magazines that are coming into your organization. List those that can be released after they have served their purpose. Current issues are not necessary or expected—but issues should not be more than four months old, and not badly mutilated. List those magazines in the coupon below and mail to Mr. Stephan. He will have sent to you the names and addresses of hospitals that need the specific magazines available in your company so that each month these may be mailed by you directly to the hospitals involved.

Under this plan, thousands of service men will have the opportunity to see and read the magazines of industry; hospitals will receive a balanced list of periodicals so that every phase of the industry may be covered.

This is a project worthy of your thoughtful consideration. Look over your magazines today, list the titles on the coupon, and mail to Mr. Stephan.

Mr. John C. Stephan, National Chairman
Committee for Technical Training Rehabilitation
National Industrial Advertisers' Association
Leader Building, Cleveland, Ohio

We will be happy to cooperate in your plan to send prepaid currently available file copies of industrial magazines to military and naval hospitals. Listed below are the magazines received here each month that are available for shipment. Please send us the names of the hospitals and their addresses so we may mail these each month.

Number of Copies	Name of Magazine
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Name of Company..
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Shepherd Gives Talk on Martempering

Reported by P. H. Tomlinson
Metallurgical Engineer, Farrel-Birmingham Co., Inc.

B. F. Shepherd, chief metallurgist of the Ingersoll-Rand Co., gave an interesting and instructive talk on the subject of "Martempering" before the April 19th meeting of the New Haven Chapter, which, however, has been outlined in previous issues of THE METALS REVIEW.

Following the dinner at this meeting Carl O. Dunbar, director of Peabody Museum and professor of paleontology at Yale, gave a coffee talk on the Russians, pointing out their national pride and ambitions.

Exhibit and Library Feature Light Metals

Edward S. Christiansen Co. has established a showroom, technical library and office in Los Angeles for the exhibition of aluminum and magnesium raw materials, semi and fully fabricated castings and wrought parts as well as finished assemblies. The displays will be changed regularly to show the trend of conversion from strictly war manufacture and use to civilian applications. The technical library will cover the technology of the light metals, their fabrication and use as well as the literature of the various manufacturers.

Playing Cards Wanted for Yanks Overseas

New or used decks of playing cards are being sent in quantity to American armed forces overseas through the efforts of the George Washington Post No. 1, The American Legion. However, thousands of additional decks are required to satisfy the growing needs of the services and widespread cooperation in these efforts is requested. Simply send cards, used or new, by parcel post or express to Charles L. Schuettler, Chairman, "Cards for Yanks," 6300 Seventh St., N.W., Washington 11, D. C.

Impurities Affect Sea Water Corrosion Of Magnesium Alloys

Reported by John Q. Adams
General Electric Co.

The important and unexpected effects of small factors on the service and fabrication behavior of magnesium alloys formed the theme of a talk by C. E. Nelson of the Dow Chemical Co. before the Eastern New York Chapter on May 15. Among such so-called "small factors" are metallic impurities, minor alloy additions, grain size, locked-up stresses, and the characteristic lack of appreciable attack of magnesium on steel equipment. Examples were given of the powerful effects of small amounts of certain elements on magnesium alloys.

A few parts per million of boron in sea water almost spelled the difference between success and failure in the early experiments with production of magnesium from sea water.

While common magnesium alloys, regardless of their purity, are very resistant to corrosion in ordinary conditions of usage such as normal atmospheres, the salt water corrosion resistance is controlled by the presence of impurities, particularly iron, nickel, and copper in excess of certain small and known values called tolerance limits. Based on this knowledge, control of such impurities has been applied in production of substantially all the wrought magnesium alloys presently used in the United States, in order to provide good salt water corrosion resistance.

In the casting alloy field, 2 to 3% zinc has been used in the common alloys, since, as was illustrated, high zinc alloys are much less sensitive to the impurities.

The effects of such elements as cerium, zirconium, and calcium on high temperature properties, ductility, and aging characteristics and formability were outlined. The interesting effect of beryllium, and to a lesser extent calcium, in cutting down oxidation rates and burning of magnesium was discussed.

Magnesium alloys possess unique advantages over many other structural metals because of their natural fine grain size and ready response to convenient means of even further grain refinement. Extensive studies have indicated that magnesium alloy castings are unique in that there are no significant residual locked-up stresses present in ordinary conditions of usage.

One of the outstanding characteristics of magnesium alloys is the fact that under normal conditions of handling they may be melted, alloyed, stirred, pumped, and cast in iron or steel equipment without damage to the alloy or to the equipment. "Magnesium can be handled amost like water!" Mr. Nelson concluded.

Powder Metallurgy Pioneer And Buick Forge Supt. Dead

Charles Hardy, president of Charles Hardy, Inc., and of the Hardy Metallurgical Co., a pioneer in the field of powder metallurgy, died recently in New York after a brief illness.

Charles Hardy

Born in Wandsbeck, Germany, Feb. 13, 1880, Mr. Hardy attended American, German and English universities. He engaged in the metal business in London before coming to this country 30 years ago and entering the metal and chemical business here. He held many patents on powder metallurgy and alkali metals, and was the author of many contributions to the technical literature.

ROBERT H. DARNTON, for the past 15 years superintendent of the Buick Forge plant, and one of the best known technicians in the forging industry, died of a heart ailment on May 27. He was 62 years old. Mr. Darnton began his career as a youthful apprentice machinist and during 18 years in shops mostly in Michigan became an expert die sinker and forgeman. He came to Buick in 1912 as a die sinker in the forge plant, became general foreman of the die shop in 1918 and forge superintendent in 1921. In 1932, Mr. Darnton became superintendent of the Buick Forge plant, the position he held until his death.

R. H. Darnton

Metal Literature Review—*Continued*

7. CLEANING & FINISHING (*Cont.*)

7-126. **Ethyl Cellulose Plastic Coatings.** R. L. Geehr. *Machine Tool Blue Book*, v. 41, June '45, pp. 275-276, 278, 280, 282.

Used as a protective coating on such precision parts as gears, bearing shells, motor splines, engine rods, shafts and many other parts. Protects highly finished surfaces with a skin-like film approximately 1/16 in. thick, which in its application has excluded all air from the highly finished surface. At the same time, the compound itself exudes a light film of oil to the surface of the part, affording easy removal and clean stripping of the coating at the time the part is to be used.

7-127. **Symposium on Surface Finish.** *Machinery* (London), v. 66, April 26, '45, pp. 457-458.

Continuity in the production of specified surface finish.

7-128. **Electrolytic Polishing of Lead Bronzes, Zinc and Magnesium Micrographic Applications.** P. A. Jacquet. Les Laboratoires L.M.T., Notice VI de la Societe "Le Materiel Telephonique," 1942, 12 pp. British Non-Ferrous Metals Research Association *Bulletin*, no. 191, May '45, p. 118.

7-129. **Introduction to the Study and Use of Electrolytic Polishing of Metals and Alloys.** P. A. Jacquet. *Metaux*, v. 18, Jan. '43, pp. 1-21. British Non-Ferrous Metals Research Association *Bulletin*, no. 191, May '45, p. 119.

7-130. **Metal Cleaning: 1—Indirect Performance Tests.** Jay C. Harris. *Metal Finishing*, v. 43, June '45, pp. 238-241, 263.

Information regarding suggested or currently used evaluation tests in readily available form. Information given in this paper should not be considered as a recommendation, since no specifications have as yet been developed. 28 ref.

7-131. **Black Anodizing Copper and Brass.** John D. McLean and C. B. F. Young. *Metal Finishing*, v. 43, June '45, pp. 247-248.

Deep black, which is adherent to copper and copper alloys, can be produced by treating the object to be colored as an anode in a strong alkali solution.

7-132. **Die Castings Can Be Colorful.** *Die Casting*, v. 3, June '45, pp. 38-39, 41.

Die castings for sales appeal and resistance to corrosion.

7-133. **Organic Finishes for Die Castings.** Gustave Klinkenstein. *Die Casting*, v. 3, June '45, pp. 66, 68.

Organic finishes developed for the die casting alloys have greatly expanded the scope of product finishing. Summary of the characteristics of these coatings.

7-134. **Drying Large and Small Work in Versatile Infra-Red Installation.** H. L. Boyden. *Industrial Heating* v. 12, June '45, pp. 1002, 1004.

Unusual features which make it more versatile than the usual set-up.

8. ELECTROPLATING

8-65. Electroforming. A. H. Stuart. *Metal Industry*, v. 66, April 13, '45, p. 236.

The use of a semi-colloidal dispersion of graphite in water to form a film on wax for subsequent electrodeposition after waterproofing is recommended in this article. 2 ref.

8-66. **Nickel Plating.** *Metal Industry*, v. 66, April 27, '45, pp. 266-268.

Precautions necessary to insure a highly finished deposit. Various compositions of bath used. (Translated and condensed from *Metallwaren Industrie und Galvanotechnik*.) 3 ref.

8-67. **Iridite Treatment for Plated Parts.** J. Albin. *Iron Age*, v. 155, May 24, '45, pp. 44-50.

Zinc and cadmium, both basically good protective films on steel, are still actively capable of corroding. By forming a coat which keeps air and moisture away from the metal surface, Iridite protects the cadmium or zinc plate to a marked degree. Iridite corrosion resistant surfaces can be obtained in several colors and finishes.

8-68. **Method of Plating of Magnesium and Magnesium Alloys (German Patent No. 727619).** E. Hartmann. *Metall Wirtschaft*, v. 22, Nov. 20, '43, pp. 524-527.

8-69. **Indium Plating with Cyanide Caustic Bath.** J. B. Mohler. *Iron Age*, v. 155, May 31, '45, p. 47.

Use of potassium hydroxide in conjunction with potassium cyanide overcomes the difficulties normally encountered in bath preparation, halts bath decomposition and eliminates the necessity of aging the plating electrolyte before use.

8-70. **The Production of Machinable Chromium Deposits.** G. E. Gardam. *Electrodepositors' Technical Society Journal*, Preprint, v. 20, '45, pp. 69-74.

Devises means of depositing chromium in a form machinable by a cutting tool with a diamond pyramid hardness number of not more than about 400.

8-71. **Bright Zinc Plating, VI.** S. Wernick. *Sheet Metal Industries*, v. 21, March '45, pp. 443-446.

Bright zinc plating; cadmium vs. zinc plating; bright zinc plating processes; chemical control; electrolytic impurities; anodes. 7 ref.

8-72. **Pressing Technique as a Preliminary to the Production of Good Electrodeposits.** J. D. Jevons. Electrodepositors' Technical Society, *Journal*, Preprint, v. 20, '45, pp. 93-104.

Gives a short description of some of the defects or conditions in metal sheet and strip which cause trouble during plating and of press shop operations and of how these influence the product from the viewpoint of the electrodepositor to whom they will be passed.

8-73. **The Influence of Anodes in Plating Processes.** S. R. Goodwin, G. M. and H. A. Bechtold. Electrodepositors' Technical Society *Journal* Preprint, v. 20, '45, pp. 105-118.

Requisites of a good anode; purity; absence of polarization; uniform dissolution; plate anode; oval anode; ball anode; gear anodes; hooks; barrel anodes.

8-74. **Industrial Chromium Plating: Bath Composition, Control, and Supervision.** R. Bilfinger. *Metall Wirtschaft*, v. 22, Oct. 20, '43, pp. 467-471.

8-75. **A New Electrolyte for Rapid Silver Plating and Polishing Baths.** R. Weiner. *Metall Wirtschaft*, v. 22, Oct. 20, '43, pp. 472-474.

8-76. **Bright Nickel Plating.** Virgil H. Waite. *Monthly Review*, v. 32, May '45, pp. 467-469.

Brief review of the factors involved in the installation and operation of a bright nickel bath.

8-77. **The Principles of Acid-Base Analysis.** Samuel Glasstone. *Monthly Review*, v. 32, May '45, pp. 471-473.

Equivalence of acids and bases; equivalent weight of base; normal solutions; acid-base titration; choice of indicator.

8-78. **Rectification and Surface Hardening of Screw Threads by Electrodeposition.** *Machinery* (London), v. 66, May 3, '45, pp. 497-498.

Rectification of worn or over-machined threads; prevention of scoring; surface hardening by chromium deposition; application to screw gages.

8-79. **Screw Threads.** *Metal Industry*, v. 66, May 4, 45, p. 280.

Rectification and surface hardening by electrodeposition. Cost of a damaged component can be saved by electrolytic deposition of nickel or chromium. (From E.T.A.C. Technical Memorandum No. 2.)

8-80. **Electro-Brightening Copper and Silver, VII.** S. Wernick, *Sheet Metal Industries*, v. 21, May '45, pp. 844-853, 865.

Bright copper plating; electrolytic polishing of copper; bright silver plating; source of brightening in carbon disulphide electrolytes; bright deposits from acid solution; electrolytic polishing of silver; effect of free cyanide; effect of temperature; effect of stirring. 27 ref.

8-81. **Electroplating: Modern Equipment and Technique, VI.** H. Silman. *Sheet Metal Industries*, v. 21, May '45, pp. 859-865.

Cyanide bath; zincate bath; plating conditions; anodes; cleaning before plating; bright zinc plating; effects of contaminants; zinc-mercury bath; acid zinc plating; operating conditions; electro-galvanizing of wires. 27 ref.

8-82. **The Deposition of Metals from Fluoborate Solutions.** Harold Narcus. *Metal Finishing*, v. 43, June '45, pp. 242-244.

With the presence of tin fluoborate it is possible to conveniently and economically make up a suitable plating bath for the electro-deposition of alloys of lead and tin in various compositions. The resulting alloy deposit is hard and relatively bright. Also discusses cadmium baths; zinc baths; indium baths.

8-83. **Inspection Tests for the Adhesion of Electroplated Coatings With Particular Reference to the B.N.F. Adhesion Test.** A. W. Hothersall and C. J. Leadbeater. *Metal Finishing*, v. 43, June '45, pp. 245-246, 273-274.

B.N.F. adhesion test developed for use in the inspection of electroplated coatings. Designed to enable nonadherent or very slightly adherent coatings of ordinary commercial thickness (up to 0.002 in.) to be detected. Appears to have possible applications to coatings, both metallic and non-metallic, formed by other methods. Apparatus described. 4 ref.

8-84. **Machinable Chrome.** G. E. Gardam. *Metal Industry*, v. 66, May 11, '45, pp. 298-299.

Necessity for the production, for a specific purpose, of a chromium deposit capable of being machined by ordinary tools, led to the development of the solution and technique described. (Electro-depositors' Technical Society.)

8-85. **Nickel Plating.** *Metal Industry*, v. 66, May 11, '45, pp. 299-300.

Formation of bright and ultra-bright deposits. Details of the composition of some of the more recent baths used for bright nickel plating. (From *Metallwaren Industrie und Galvanotechnik*, 1943.)

8-86. **Electromotive-Force Measurements of Molten Binary Alloys.** Ralph A. Schaefer and Frank Hovorgka. Electrochemical Society Preprint, 87-23, 20 pp.

Potentials were measured in a reversible cell. Whenever intermetallic compounds exist in the solid state, the properties are more or less abnormal in the liquid state. This points to the fact that there probably is a definite relationship between Stewart's work on "cybotatic" state and the metallic solutions of the type studied.

9. PHYSICAL AND MECHANICAL TESTING

9-67. **Influence of Clamping Effect on the Fatigue Behavior of Work-hardened Ductile Aluminum-Copper-Manganese Alloys.** Heinrich Cornelius. *Zeitschrift für Metallkunde*, v. 36, May '44, pp. 101-105.

9-68. **Behavior of Special Heat Resistant Alloys Under Creep Test at 620° C.** Eberhard Both. *Zeitschrift für Metallkunde*, v. 36, June '44, pp. 149-152.

9-69. **The Velocity of Propagation of Brittle Cracks in Steel.** M. Greenfield and G. Hudson. National Academy of Sciences *Proceedings*, v. 31, May '45, pp. 150-152.

Characteristics of brittle failures.

9-70. **Yielding and Fracture of Medium Carbon Steel Under Combined Stress.** E. A. Davis. *Welding Journal*, v. 24, May 25, pp. 283s-294s.

Results of combined stress tests on a medium carbon steel; attention to the magnitude and distribution of the stresses and strains at the instant preceding fracture. Effect of the shape of the test specimens and the isotropy of the material upon the rupture properties.

9-71. **Indentation Hardness.** G. C. Richer. *Metallurgia*, v. 31, April '45, pp. 296-299.

Outline of a physical interpretation based directly on stress-strain relationships.

9-72. **The Shape of a Material's Reactions to Force, Part 2.** A. C. Vivian. *Metallurgia*, v. 31, April '45, pp. 301-307.

Some type of coefficient for use in converting the standard (normal temperature and time) curve to the shape prevailing at other temperatures and loading rates should ultimately be devised, when the applicability of the new proposals will be quite universal to materials worth the name.

(Continued on Page 10)

9. TESTING (Cont.)

9-73. **Theory of Bending, Torsion and Buckling of Thin-Walled Members of Open Cross Section.** Stephen P. Timoshenko. Franklin Institute *Journal*, v. 239, March '45, pp. 201-219.

Analysis of bending of thin-walled members of open cross section and establishes the notion of shear center. By the use of Maxwell's reciprocal theorem there is established the identity of shear center and center of twist. Next comes instability problems and torsional and lateral buckling of beams.

9-74. **Fracture Testing of Alloy Steels for Aircraft Engine Forgings.** R. D. Haworth, Jr. and A. F. Christian. American Society for Testing Materials, Preprint A4, 1945, 34 pp.

Unusual condition of alloy steel forgings, shown by fracture examination and termed "grain coarsening," has attracted considerable interest in recent years among the manufacturers of highly stressed aircraft engine parts. The appearance of large grains or "facets" on the fractured surface of fully heat treated forgings was generally considered indicative of overheating during the forging operation. However, it has been clearly demonstrated that this condition can be produced in certain heats of steel at normal forging temperatures. Other factors equally as influential as heat sensitivity are: (1) The time of temperature, and (2) the amount of reduction during the forging operation.

9-75. **Fatigue Tests of Airplane Generator Brackets with Special Reference to Failure of Screw Fastenings.** A. M. Wahl. *Journal of Applied Mechanics*, v. 12, June '45, pp. A-113-A-122.

Fatigue tests on forged steel airplane generator brackets of different proportions. In many cases the limiting factor in the strength of the assembly was not that of the bracket itself but rather that of the screw fastenings used to hold the bracket to the generator frame. The fatigue strength of these screw fastenings is largely dependent on the rigidity of the bracket rim.

9-76. **Effect of Length on Tensile Strength.** C. Gurney. *Nature*, v. 155, March 3, '45, pp. 273-274. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 155-A.

The results of a large number of tension tests on nominally identical test-pieces are conveniently represented by frequency curves. Equations and curves are developed for deriving the distribution of the strength of rods having lengths equal to a multiple of that of the rods tested.

9-77. **Changes Taking Place in the Crystal Structure of Metals Under Tensile and Alternating Stresses.** A. Thum and C. Petersen. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 547-551.

Attempt at untangling factors producing damage in fatigue by correlation with damping behavior at different loads and in different stages of fatigue. General speculation, rather than experimental evidence.

9-78. **The Influence of the Size and Form of the Cross Section on the Endurance Limit of Metal Under Asymetrically Distributed Stresses.** L. Foppl. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 552-553.

Discussion of effect of stress gradient on endurance, based on experimental work of H. G. V. Phillips, published February, 1942, but not reproduced.

9-79. **A Small French Fatigue Testing Machine.** H. Oshatz. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 558-559.

Small testing machines for fatigue testing in tensile, torsion, or repeated bending are briefly described.

9-80. **Load Calibration Equipment for Testing Machines.** G. L. Brown and H. T. Loxton. *Journal* of the Institution of Engineers, Australia, v. 16, Dec. '44, pp. 235-239. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 155-A.

Methods used for the load calibration of all types of testing machines and their suitability and accuracy are discussed. A brief description is given of standard types of equipment, including a new design of loop dynamometer and the Amsler standardizing box.

9-81. **Methods of Testing Stopper Heads.** J. A. Shea. *Industrial Heating*, v. 12, June '45, p. 1016.

Laboratory tests for predetermination of the quality of stopper heads, that show good correlation with actual service results.

10. ANALYSIS

10-43. **Continuous Photometric Determination of Bivalent Copper in Ammoniacal Solution.** Earl H. Brown and James E. Cline. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, May '45, pp. 284-285.

Photometric instrument developed to record continuously the concentration of bivalent copper in the ammoniacal copper solution used at the TVA ammonia plant for absorbing oxides of carbon and other harmful impurities from the synthesis gas. The copper solution flows through the annular space between two concentric tubes in an all-glass light-absorption cell surrounding a light source operating on stabilized voltage. The light transmission is measured by a recording potentiometer in circuit with a barrier-layer photocell. 2 ref.

10-44. **X-Rays Afford New Means of Chemical Analysis.** *Iron Age*, v. 155, June 7, '45, p. 62.

Shooting a beam of X-rays through an unknown chemical substance to see how much of the radiation is absorbed is a new and rapid means of identifying the elements of which the material is made. Method can be used with gases, liquids or solids.

10-45. **Qualitative Inorganic Microanalysis Without Hydrogen Sulphide, Part I.** R. Belcher and F. Burton. *Metallurgia*, v. 31, April '45, pp. 317-319.

Detection of the common metallic ions on the micro scale. Sulphuretted hydrogen is not used as a reagent. Advantages and disadvantages discussed.

10-46. **Determination of Sulphur in Steel.** *Chemical Age*, v. 52, April 28, '45, pp. 367-368.

New apparatus for the rapid determination, by combustion, in about four minutes, of sulphur in iron, steel, and ferrous and non-ferrous alloys.

10-47. **Detection of Beryllium in Copper-Base Alloys.** Frank Kulcsar. *Chemist Analyst*, v. 34, May '45, pp. 28-29, 39.

Reagents; procedure; sensitivity; interfering elements. 2 ref.

10-48. **How White Motor Company Checks Steel Analyses.** D. B. Wilkin. *Steel*, v. 116, June 11, '45, pp. 120-122, 158, 160, 162.

Metallurgy department uses low power thermocouple system for checking incoming steel and material in inventory against master samples.

11. LABORATORY APPARATUS, INSTRUMENTS

11-31. **Continuous Determination of Carbon Dioxide by Electroconductivity.** Earl H. Brown and Maurice M. Felger. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, May '45, pp. 283-284.

Electroconductometric analyzer for the continuous determination of the carbon dioxide concentration in ammonia plant gases described. Results given by the analyzer to the operation of both the water and copper scrubbers of the gas purification system of the TVA synthetic ammonia plant given. The range of the analyzer described is 0 to 2%, but the analyzer is adaptable to other ranges. 3 ref.

11-32. **Comparison of Surface Roughness of Highly Finished Plane Surfaces.** J. Kluge and G. Bochmann. *VDI Zeitschrift*, v. 88, April 1, '44, pp. 179-181. *Engineers' Digest* (American Edition), v. 2, May '45, pp. 215-216.

Less important to determine surface profile than to ascertain whether repeated re-finishing of a surface will produce identical surface roughness. New apparatus developed for this. Instrument operates on the principle of throwing a parallel beam of light upon the surface under an angle of 45°. Reflected beam is then passed through a lens followed by an aperture and a photocell.

11-33. **Symposium on Surface Finish.** *Machinery* (London), v. 66, April 12, '45, pp. 403-405.

Measurement of surface waviness.

11-34. **Electronics at Work.** Clark E. Jackson. *Modern Metals*, v. 1, April '45, pp. 18-20.

Basic functions of electronics in light metal industry.

11-35. **Comparison Between Back-Reflection and Film-Impression Methods of Microscopic Surface Representation.** Edith Summler-Alter and Igeborg Ziesecke. *Zeitschrift für Metallkunde*, v. 36, May '44, pp. 115-119.

11-36. **The Amplidyne Generator from an Application Standpoint.** J. D. Campbell. *Iron & Steel Engineer*, v. 22, May '45, pp. 54-61.

Development of auxiliary exciters of special characteristics has resulted in improved control systems in a variety of applications . . . under several trade names, units of this type have been widely used in steel plants.

11-37. **Evaluation of the Finish of a Metal Surface by a Replica Method.** Harry K. Herschman. National Bureau of Standards *Journal of Research*, v. 34, Jan. '45, pp. 25-31.

Method for evaluating surface finish through the medium of a nearly transparent plastic replica of a surface described. The method consists essentially in passing a narrow beam of light transversely through the moving replica onto a photoelectric cell. Variations in the geometric characteristics of the film, which are associated with the serrations of the surface reproduced, control the intensity of the light passing through the film and reaching the photocell at any instant. The fluctuations of intensity of the transmitted light cause a pulsating voltage in the cell circuit, which is recorded by an electronic voltmeter. This voltage increases with increased surface roughness. The evaluations obtained by this means are very promising. Results for different surface finishes are correlated with profile measurements of the surface determined with the microscope. 7 ref.

11-38. **New X-ray Diffraction Apparatus.** *Chemical Age*, v. 52, April 28, '45, p. 369.

In the base of the cabinet is housed the high tension generator (including the tube filament transformer), from which full-wave rectified high tension is fed to the cathode of the X-ray tube, a circuit consisting of a center earthed transformer and two oil-immersed rectifying valves being employed.

11-39. **Surface Measurement.** *Aircraft Production*, v. 7, May '45, p. 219.

Instrument for recording the quality of finish operates on a simple pneumatic principle and gives a pen-record of the profile of the surface along a selected straight track. It is easily adjustable to suit any class of surface normally encountered in the modern engineering workshop.

11-40. **Electronics Provides New Tools for Chemical Industry.** *Chemical Industries*, v. 56, June '45, pp. 956-959.

The microwave spectroscope, electron microanalyzer, and the process of chemical synthesis by ion bombardment of solids.

11-41. **The Measurement of Surface Finish.** H. P. Jost. Liverpool Engineering Society *Transactions*, v. 65, 1944, pp. 49-70. Iron and Steel Institute *Bulletin*, no. 112, April '45, pp. 154-A-155-A.

11-42. **The Preparation of Cemented Carbides for Micro-Examination.** D. H. Shute. *Metal Treatment*, v. 12, Spring '45, pp. 13-18, 37.

Various methods of polishing cemented carbides for micro-examination. Etching also discussed and does not present any special difficulty provided certain fundamental differences in the compositions of the various grades are taken into account. Actual microscopic examination usually involves high magnifications. 9 ref.

12. INSPECTION AND STANDARDIZATION

12-99. **Magnetic Crack Detection.** I. J. E. D. Bell. *Aircraft Engineering*, v. 17, Feb. '45, pp. 58-60.

Principles and operational practice.

12-100. **Air-Operated Gages.** *Production and Engineering Bulletin*, v. 4, April '45, pp. 121-128, 132.

Application of pneumatic gaging extended by using higher operating pressures.

12-101. **Safety Inspection of Finishing Departments.** J. A. Bede. *Organic Finishing*, v. 6, May '45, pp. 31-33.

"Safety Inspection Check List" is given.

12-102. **Weldment Inspection Methods.** *Industry & Welding*, v. 18, June '45, pp. 38-39, 43, 102-104.

Radiography; magnetic tests; equipment; stethescope test; microscopic examination.

12-103. **Dynamic Inspection Method of Checking Bearing Tolerances.** Richard McKendry. *Product Engineering*, v. 16, June '45, pp. 372-373.

Principles underlying the dynamic tolerance method of testing bearings for initial friction, end play or wobble, and coordinate speed. Method is a radical departure from established inspection methods based on the direct system of measuring radial, axial, and torque tolerances. Testing machine, auxiliary apparatus, and procedure described.

12-104. **Electronic Measurement, Analysis, and Inspection. I.** Holbrook L. Horton. *Machinery*, v. 51, June '45, pp. 157-161.

Ways in which electronic devices can be applied in the mechanical field.

12-105. **Magnetic Powder Inspection of Castings.** Clyde L. Frear. *Foundry*, v. 73, June '45, pp. 104-107, 273, 274, 276, 278.

Magnetic powder use for disclosing defects in steel castings.

12-106. **Magnesium Alloy Aircraft Casting Inspection.** Robert Taylor. *Iron Age*, v. 155, June 7, '45, pp. 63, 142.

Gas bubbles entrapped below the surface of the casting are often protected by a tough oxide skin from the effect of the sand blast. Method of distinguishing color patches following a chrome pickle treatment which leads to the detection of such cavities.

12-107. **Air Gages for Inspection of Precision Work.** A. R. *Machinery* (London), v. 66, April 19, '45, pp. 425-426.

Precision inspection of parts, and their classification in groups of uniform size within accuracy limits of 0.0001 in. simplified by the use of air gages of identical design.

12-108. **A Photo-Induction Defectoscope.** *Metallurgia*, v. 31, April '45, pp. 293-295.

Detecting defects in metals by means of photo-electric measurements. Novel and relatively simple testing method which appears worthy of further study.

12-109. **The Yielding Phenomenon of Metals, Part IV.** Georges Welter. *Metallurgia*, v. 31, April '45, pp. 309-315.

Influence of speed and loading conditions.

12-110. **Routine Inspection by Optical Projection.** *Machinery* (London), v. 66, April 26, '45, pp. 445-449.

Hilger projector is readily adaptable to routine inspection of comparatively small components which are produced in large quantities.

12-111. **A New Gaging Method for Quality Control.** P. M. Dickerson. *Steel*, v. 116, May 28, '45, pp. 105, 146.

Method for detecting trends and distributions in defective production, used in conjunction with go-no-go gages, charts parts progress in relation to tolerances on hourly basis. Rework reduced from 10 to less than 1%.

12-112. **Determination by Statistical Analysis of Process Minimums for Spot Welding.** Harold Robinson. *Welding Journal*, v. 24, May '45, pp. 455-461.

Statistical procedure designed to account for the inherent variability of a given process (e.g., spot welding) in establishing process minimums. This method provides a minimum and measurable risk against the process falling below specification quality. To use the procedure outlined, requirements must be met. These requirements discussed in detail. 7 ref.

12-113. **Testing the Quality of Steel by Magnetic Methods.** H. Sjövall. *Jernkontorets Annaler*, v. 128, no. 12, '44, pp. 610-616. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 157-A.

12-114. **The Order of Stating Elements in Analyses.** *Jernkontorets Annaler*, v. 128, no. 12, '44, p. 621. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 161-A.

12-115. **The Uses and Limitations of the Spectrograph.** J. F. McNeil. *Australasian Engineer, Science Sheet*, Dec. 7, '44, pp. 10-14. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 161-A.

12-116. **Quality Control of Metallic Arc Welds by Radiographic Examination.** John J. Chyle. *Industrial Radiography*, v. 3, Winter '44-45, pp. 13-21.

Radiographic examination primarily differentiates variations in density of matter and it is for this reason that radiographic examination is so successful in examining welds. Variation in density of weld metal is due to the presence of one or more of the following defects: Gas cavities, cracks, lamination, slag, oxides or other non-metallic inclusions.

12-117. **Adjustable Radium Capsule Support.** J. Bland and E. Banks, Jr. *Industrial Radiography*, v. 3, Winter '44-'45, pp. 23-25.

Simplicity of the gamma-ray (radium) radiographic method includes the use of simple positioning equipment for supporting the radium-containing capsule during an exposure. Function of the radium capsule support is merely to locate the radium at a fixed, previously determined distance from the film.

12-118. **A Practical Comparison of Fluoroscopy and Radiography.** R. W. Mayer. *Industrial Radiography*, v. 3, Winter '44-'45, pp. 28-35.

Emphasis is necessarily on fluoroscopy in effort to bring up-to-date knowledge of it so intelligent comparisons on the advantages of both inspection methods can be made.

12-119. **A Simplified Method of Film Evaluation.** Emery Meschter. *Industrial Radiography*, v. 3, Winter '44-'45, pp. 35-37.

Outlines the principles of a method of film evaluation which yields information on this point, utilizing a minimum of special equipment and requiring a minimum expenditure of time. Procedure has proved useful and gives results which are in good agreement with conclusions based upon practical experience.

12-120. **Industrial Radiation Hazards.** C. B. Braestrup. *Industrial Radiography*, v. 3, Winter '44-'45, pp. 37-41.

Safeguards consist in reducing the unwanted, or stray, radiation to a negligible amount, preventing superficial injuries. Summary of experiences gained from stray radiation surveys of about 60 industrial installations using voltages from 30 up to 1000 kv. and gamma rays. 12 ref.

12-121. **X-Ray Diffraction—an Industrial Tool.** J. S. Buhler. *Industrial Radiography*, v. 3, Winter '44-'45, pp. 41-44.

Describes equipment and discusses its industrial applications.

Metal Literature Review

12-122. **Interpretation of Radiographs.** *Industrial Radiography*, v. 3, Winter '44-'45, pp. 44-45.
Stress is laid on the necessarily complementary parts played by visual inspection and radiography in assessing quality of castings. Attempts at quantitative interpretation are commented upon.

12-123. **Quality Control.** H. L. Collins and R. W. Callon. *Canadian Metals and Metallurgical Industries*, v. 8, May '45, pp. 20-25.
Equipment and methods used in control and development laboratories. 5 ref.

12-124. **The Use of Radio-Frequency Apparatus in Inspection.** James Cornelius. *Machinery* (London), v. 66, May 3, '45, pp. 473-476.
Radio-frequency apparatus to measure one-thousandth part of a millionth of an inch and instrument by which this variation can be detected is described.

12-125. **Specifying Steel by Performance.** G. V. D. *Machinery* (London), v. 66, May 3, '45, pp. 487-488.
Jominy test; procedure of test.

12-126. **Testing Non-Ferrous Metals by New Magneto-Inductive Method.** W. Schirp. *Elektrotechnische Zeitschrift*, v. 64, no. 31/32, August 12, '43, pp. 413-415. *Engineers' Digest* (American Edition), v. 2, May '45, pp. 238-240.

12-127. **Magnetic Powder Inspection and Its Practical Application.** J. W. Jenkins and K. D. Williams. American Society of Naval Engineers *Journal*, v. 57, May '45, pp. 166-187.
Sub-surface defects; shaft surfaces other than journal areas; surface of journals; gear tooth surfaces; proof of method; test procedure; test rotors; magnetic flux densities in crack detection.

12-128. **Magnaflux Testing of Steel Castings.** American Society of Naval Engineers *Journal*, v. 57, May '45, pp. 256-260.
Classification of castings for application of radiographic standards; electric current requirements; test specifications; interpretation of tests; complementary testing; detection of cracks. (From *Marine Engineer*, Nov. '44.)

12-129. **Quality Control Applied to Die Casting.** *Aircraft Production*, v. 7, May '45, pp. 216-218.
Novel use as a check against porosity during manufacture.

12-130. **The Choice of Engineering Materials.** M. L. Yates. *Steel Processing*, v. 31, May '45, pp. 319-320.
Use of standards; price and cost.

12-131. **Controlling Quality by Statistical Methods.** Joseph Manuele. *Steel*, v. 116, June 11, '45, pp. 123-124, 164, 168, 170.
Operating procedures.

13. TEMPERATURE MEASUREMENT AND CONTROL (PYROMETRY)

13-12. **The Immersion Thermocouple in the Gray Iron Foundry.** R. C. Tucker. *Foundry Trade Journal*, v. 75, April 26, '45, pp. 335-341.
Use for the control of casting temperature, solidification range and rates of cooling. 5 ref.

13-13. **A New Thermo-Element Independent of the Temperature of Comparison Point.** Hans Thomas. *Zeitschrift für Metallkunde*, v. 36, June '44, pp. 140-141.

13-14. **Continuous Determination of Oxygen and Combustibles.** J. F. Luhrs. *Iron & Steel Engineer*, v. 22, May '45, pp. 45-53.
Rapid measurement of oxygen and combustible contents of gases offers great possibilities in the control of furnaces of all types . . . equipment has been developed to do this efficiently and accurately.

13-15. **Recording Die Temperatures.** A. H. Nicholson. *Metal Industry*, v. 66, May 18, '45, pp. 306-307.
One of the most important factors in the production of uniform die castings is the maintenance of regular die temperatures. Describes a simple means of die temperature control.

13-16. **Symposium on Measurement of Heat Absorption in Furnaces, Part 2.** *Industrial Heating*, v. 12, May '45, pp. 772, 774, 776, 778, 806.
Measurement of the heating rate of the charge in furnaces (a correlation of direct measurements with the results obtained by the electrical analogy method) discussed.

13-17. **Symposium on Measurement of Heat Absorption in Furnaces, Part III.** *Industrial Heating*, v. 12, June '45, pp. 946, 948, 950, 952.
New method for measurement of fluid flow applicable to studies of convective heat transfer.

13-18. **The Measurement and Control of Open-Hearth Flame Radiation Intensity.** A. L. Hodge. *Industrial Heating*, v. 12, June '45, pp. 988, 990.
Measurements using a radiation receiver with a fused silica lens made at each wicket during each reversal after melting.

13-19. **Aluminum Radiamatic Housing.** *Modern Metals*, v. 1, June '45, pp. 25-26.
Aluminum chosen for the construction of housings because of its high degree of thermal conductivity and dissipation of radiant heat. The theory and principle of radiation pyrometry discussed.

13-20. **Bollenrath's Dilatometer in Practical Application.** A. Metz. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 559-561.
Several improvements and additions to the Bollenrath dilatometer are described.

13-21. **Anticipator Improves Temperature Control.** M. J. Manjoine. *Machine Design*, v. 17, June '45, p. 116.
Vacuum-tube thermocouple device increases the sensitivity and response of conventional temperature controls by 1000%; consists of two thermocouples of different thermal capacity and an electric heating element, enclosed in an evacuated glass envelope.

13-22. **Temperature of Steel Bath Measured in Five Seconds.** *Blast Furnace and Steel Plant*, v. 33, June '45, pp. 712-713.
With a modified Collins-Oseland tube equipped with a photronic cell and amplifying and recording instruments, a satisfactory temperature determination requires but five seconds. The all-steel tube in the hands of an experienced operator will last for more than a thousand readings.

14. FOUNDRY PRACTICE AND APPLIANCES

14-163. **Little Recognized Factors Influencing the Quality of Aluminum Pressure Die Cast Parts.** James L. Erickson. *Aluminum & Magnesium*, v. 1, May '45, pp. 16-19, 30-32.
Chemical composition and cleanliness of the ingot metal; size and weight of the ingots; holding furnace; crucible or pot material and pot wash; thermo-control system; absorption of gases and the consequences; flux; temperature of retention of the molten metal; time of retention of the metal; turbulence in the melt.

14-164. **Malleabilization of White Cast Iron.** E. E. Howe. *Better Enameling*, v. 16, May '45, pp. 6-8.
Satisfactory malleable casting can be obtained from white cast iron by holding at 1650° F. for 15 hr., cooling rapidly to 1250° F. and holding for 20 hr., followed by air cooling to room temperature. The resulting material may be considered a spheroidized pearlitic malleable cast iron, which has comparable ductility to that of a true malleable.

14-165. **A New Automatic Casting Machine for the Production of Metal Ingots and Blooms.** Kurt Hoffmann. *Zeitschrift für Metallkunde*, v. 26, Feb. '44, pp. 46-48.

14-166. **Quality Control in Die Casting.** *Production and Engineering Bulletin*, v. 4, April '45, pp. 129-132.
Statistical methods of control are not limited to controlling the quality of work produced on machine tools, but also provide a useful check on the soundness of die castings and assist in maintaining quality at a high level.

14-167. **Vacuum Casting of Electronic Parts.** Kenneth Rose. *Metals and Alloys*, v. 21, May '45, pp. 1324-1326.
Vacuum melting and casting of metal parts that must be highly pure or gas-free, such as the copper anodes for X-ray tubes whose manufacture (using induction heating) is described.

14-168. **The Basic Principles in the Feeding of Castings.** J. G. Nisbet. *Foundry Trade Journal*, v. 75, April 12, '45, pp. 293-297; April 19, '45, pp. 319-322.
Standard methods of running compared with the author's preferences.

14-169. **The Manufacture of Special Heat-Resisting Cast-Iron Retorts.** F. J. Bullock. *Foundry Trade Journal*, v. 75, April 19, '45, pp. 323-325.
Testing; making of the pattern; core iron; molding on end; mold pressure; molding on side; assessing the blame; horseshoe nails; question of design.

14-170. **Casting Tool Steels Centrifugally.** *Steel*, v. 116, June 4, '45, p. 112.
Using an indirect arc, rocking melting furnace the tools are cast centrifugally in molds approximately to finished size. Tools retain their cutting ability on many types of work several times longer than previously had been considered possible, and cutting speeds can safely be increased by 20%.

14-171. **Magnesium Castings for Aircraft Engines.** Edwin Bremer and Huey Summers. *Foundry*, v. 73, June '45, pp. 86-89, 190, 192, 196.
Diagrammatic sketch of Wright Aeronautical Corp. production equipment arranged so that there is a steady flow of materials in various stages from one end of the plant to the other. Has well equipped pattern shop; uses electro-magnets in the interior of core patterns for holding chills and wires in place.

14-172. **Aluminum Foundry Practice.** F. D. Chew. *Foundry*, v. 73, June '45, pp. 90-91, 220, 222, 224, 226.
Points to be observed and problems to be solved in producing satisfactory aluminum castings.

14-173. **Gray Iron Castings for Power Plant Equipment.** Pat Dwyer. *Foundry*, v. 73, June '45, pp. 96-98, 216, 218.
Production of gray iron castings by the Elliott Co. Describes pattern equipment; cleaning the castings.

14-174. **Two Anomalies of Graphitization.** Lester Crome. *Foundry*, v. 73, June '45, pp. 100-101, 246, 248.
Effects of silicon and aluminum as graphitizers in the production of malleable iron for white iron castings.

14-175. **Foundry Facing Materials.** J. A. Ridderhof. *Foundry*, v. 73, June '45, pp. 102, 260, 262, 264.
Use seacoal for facing having a fineness number close to that of the sand in which it is mixed. Do not expect core and mold coatings to correct poor sand. Use additional binder and bentonite if more than 10 to 15% of other materials are added. Standardize solution Baumés and control all mixes with a hydrometer. Use care in torch drying molds to prevent burning the binder out of the coating.

14-176. **Let's Have More Research.** Edwin Bremer. *Foundry*, v. 73, June '45, pp. 103, 232, 234.
Research in foundry products and foundry practices must keep pace with developments in other industries if castings are to maintain or improve their competitive position among engineering materials.

14-177. **Microporosity in Magnesium Alloy Castings.** W. A. Baker. Institute of Metals *Journal*, v. 71, April '45, pp. 165-204.
Causes of porosity in sand blasting studied, and a theory advanced to account for its formation and characteristic features. Porosity is due to freezing shrinkage and dissolved hydrogen may aggravate the trouble; the sources of contamination and methods for the removal of dissolved gas discussed. The defect is overcome in practice by careful attention to casting technique, and evidence presented to illustrate the importance of some of the factors involved. 7 ref.

14-178. **Continuous Casting.** L. H. Day. *Metal Treatment*, v. 12, Spring '45, pp. 43-48.
Principles of various machines in current use, and shows how they are applicable to the continuous casting of ferrous and non-ferrous tubes.

14-179. **Elimination of Cracks in Magnesium Pressure Die Castings.** *Light Metal Age*, v. 3, May '45, pp. 14-16.
Study of the procedure used to determine causes of the cracking in magnesium pressure die cast parts, together with recommendations and discussion towards correcting the condition.

14-180. **Technical Control in the Jobbing Foundry.** R. D. Cheyne. *Foundry Trade Journal*, v. 76, May 17, '45, pp. 47-50.
Influence of one variable factor upon another; role of the patternshop; oil sands; hydraulic spindle casting; valve block casting.

14-181. **Metallurgy in the Non-Ferrous Foundry, VIII.** A. C. Boak. *Canadian Metals and Metallurgical Industries*, v. 8, May '45, pp. 30-32.
Molding sand.

(Continued on Page 12)

14. FOUNDRY PRACTICE (*cont.*)

14-182. **"Whirl-Gate" and "Atmospheric" Heads.** *Canadian Metals and Metallurgical Industries,* v. 8, May '45, pp. 33-35.
Pioneer work in developing the whirl-gate head and recent applications of this type of head and of the atmospheric head.

14-183. **Die Stresses.** E. Mickel. *Metal Industry,* v. 66, May 4, '45, pp. 276-279.
Destructive effects on pressure-casting dies in operation. (Translated from *V.D.I. Zeitschrift.*)

14-184. **Solidification of Metals.** H. A. Schwartz. *American Foundryman,* v. 7, June '45, pp. 26-29.
Basic principles of metals solidification—heat transfer. Equilibrium; cooling rate; solidification structures; solubility; physical properties of materials; "diffusivity"; latent heat of fusion; coefficient of thermal expansion; metal flow; surface tension; progressive feeding; application of principles; physicist in the foundry; technology vs. craftsmanship.

14-185. **Malleable Iron Control.** M. E. McKinney. *American Foundryman,* v. 7, June '45, pp. 31-37.
Control processes deal with melting the cold charge in powdered coal fired reverberatory furnaces and annealing the castings in periodic ovens. Many of the control principles discussed could be applied to other melting and annealing processes.

14-186. **Describes Improved Methods in Making Match Plates of Plaster Composition.** C. C. Brisbois. *American Foundryman,* v. 7, June '45, pp. 38-43.
Varied experiments with composition match plates and a compilation from service records embodying points of interest to every practical foundryman. Facts and figures have been set down—the methods outlined may be studied in relation to individual methods and experiments in this field. Various problems encountered—the means by which they were overcome—and the development of an entirely new technique for matchplate production are described.

14-187. **Reduction of Microporosity in Magnesium Alloy Castings.** James DeHaven, James A. Davis and L. W. Eastwood. *American Foundryman,* v. 7, June '45, pp. 44-53.
Laboratory and production foundry test results indicate that the occurrence of microporosity in magnesium alloy castings may be markedly reduced by the use of melt degassing methods described. 6 ref.

14-188. **Elevated Temperature Tests in Sand Control.** Arnold Satz. *American Foundryman,* v. 7, June '45, pp. 55-59.
Controlling sands by elevated temperature tests. Securing a good base sand and using the hot compressive strength test at 2000° F. forms the basis for the preparation and maintenance of a sand mixture suitable to any specific job. The balanced base sand is chosen from the results of "spall" tests, after which hot compressive strength values lying within a definite range are maintained in the ensuing sand mixture by means of clay manipulation. Use of this method results in reduction of scrap losses due to scabs and sand inclusions.

14-189. **Die Castings for the Perfect Blend.** Francesco Collura. *Die Casting,* v. 3, June '45, pp. 20-22, 43-44, 46, 54-55.
Appearance; strength; economy; finish.

14-190. **British Permanent Molding.** Jack W. Wheeler. *Modern Metals,* v. 1, June '45, pp. 14-17, 19.
Early development of light metal permanent mold castings in England and the more recent developments brought about by war. Production methods, specific applications and the future of permanent mold castings.

14-191. **Making Standard Cast Models in Rubber Molds.** Paul Lupke, Jr. *Mechanical Engineering,* v. 67, June '45, pp. 385-386, 397.
Objective of the present process is to produce limited numbers of more or less complex pieces, without investment in high-cost dies, without highly skilled labor, and on short notice.

14-192. **Automobile Castings.** *Iron and Steel,* v. 18, May '45, pp. 150-155.
Quantity production.

14-193. **Precision Casting of Low Alloy Steels.** Lester W. Gott. *Iron Age,* v. 155, June 21, '45 pp. 46-55.
Investment casting process as a valuable supplement to conventional machining methods for producing small mechanism parts for cannon of carbon and low alloy steels. Includes cost and dimensional tolerance data on specific components, together with metallurgical and mechanical properties.

15. SALVAGE AND SECONDARY METALS

15-18. **The Reclamation of Aluminum Alloys in an Aero-Engine Foundry.** A. H. Rathbone. *Foundry Trade Journal,* v. 75, April 12, '45, pp. 299-302; April 19, '45, pp. 315-318.
Utilization of secondary alloys dictated by wartime conditions.

15-19. **Scrap Aluminum Converted to New Metal.** *Automotive Industries,* v. 92, May 15, '45, p. 56.
Scrap aluminum converted into new aluminum. Process centers around way for returning the scrap aluminum to the Bayer Process.

15-20. **The Recovery of Hard Metal from Grinding Dust and Grinding Sludge.** E. Dinglinger. *Werkstattstechnik der Betrieb,* v. 37/22, no. 5, May '43, pp. 181-183. *Engineers' Digest* (American Edition), v. 2, May '45, pp. 221-223.
Hard metal scrap occurs as chippings in the manufacture of the tools, when cracked tips are detached; when all remnants or odd pieces of used tools are broken up. Recommendations for the collection and utilization of hard metal scrap given. Recovery of tungsten from grindings can be substantially easier and more economically planned.

15-21. **New Aluminum From Old.** *Aluminum News-Letter,* June '45, p. 2.
Scrap aluminum converted into new aluminum by means of a special chemical process.

15-22. **Improved Methods of Utilizing Tin Plate Discard.** C. D. Downie. *Sheet Metal Industries,* v. 21, May '45, pp. 821-823.
Initial handling and soldering; cutting the stack; combined sawing and filing machine used.

16. FURNACES AND FUELS

16-51. **World's Largest Rotary-Hearth Furnace Heats Billets for Piercing Mill.** John H. Loux. *Industrial Heating,* v. 12, May '45, pp. 791-792, 794, 796, 798, 800, 761.
Furnace dimensions and burner equipment; hearth construction; shell design; control; flues; uniformity of heating; operating advantages; charging and discharging machines.

16-52. **Combustion, Temperature and Quality Control in Open-Hearth Furnaces.** B. B. Rosenbaum. *Industrial Heating,* v. 12, May '45, pp. 802, 804, 806.
Summarizes the discussions on combustion and temperature control in open-hearth furnaces, and the metallurgy and quality of open-hearth steel, which formed part of the program of the recent Philadelphia Section meeting of the National Open Hearth Committee of the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers.

16-53. **Open-Hearth Furnace Operation and Maintenance.** *Industrial Heating,* v. 12, May '45, pp. 842, 844, 846, 848.
Life of refractories; handling methods; mechanical slag removal methods; cleaning checker flues; hot metal mixers; use of sinter, nodules and briquettes.

16-54. **Development of the Industrial Vacuum-Melting Furnace.** Werner Messenbruch and Karl Schichtel. *Zeitschrift für Metallkunde,* v. 36, June '44, pp. 127-130.

16-55. **The Flow of Air and Gas in Vertical Flue Coke Ovens.** George A. Davis. *Blast Furnace and Steel Plant,* v. 33, May '45, pp. 568-578.
Zones of distribution; other types; regenerator distribution; distribution in the vertical flue system; lean gas underfiring; formulas used in distribution design.

16-56. **Modern Blast Furnace Design and Operation, Part V.** James Dale. *Blast Furnace and Steel Plant,* v. 33, May '45, pp. 579-581, 614.
Rate of blowing a blast furnace, to secure maximum economic efficiency. (West of Scotland Iron and Steel Institute.)

16-57. **Some Operating Experiences With High Pressure Land Boilers.** R. Carstairs, P. Hamer and B. M. Thornton. *Blast Furnace and Steel Plant,* v. 33, May '45, pp. 586, 588-590.
High pressure boilers; economizers; evaporation bank.

16-58. **How Will You Choose Your Drying Oven?** Hubert Glatte. *Industrial Gas,* v. 23, May '45, pp. 14-17, 31-32, 34.
Relationship of inductive heating to infra-red electric lamp heating is so remote that, except for two common characteristics, they are strangers. They both use electricity as their source of energy and they are both developments stemming from originally troublesome features of certain electric equipment. Cost and efficiency of equipment; cost of operation; control of temperature; safety; quality of production; capacity of equipment.

16-59. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces, XXVIII.** *Industrial Gas,* v. 23, May '45, pp. 20, 22, 29-30.
Galvanizing furnaces, gas-fired. The Selas Co. galvanizing furnace. 8 ref.

16-60. **Limitations of Dielectric Heating.** Carl J. Madsen. *Aero Digest,* v. 49, June 1, '45, pp. 112, 240.
Concerned with only dielectric heating—heating of materials by a varying electric field—and reviews the major limitations that prevent universal application.

16-61. **Selecting Gas Immersion Tubes.** *Steel,* v. 116, June 4, '45, pp. 108-110, 146, 148.
Data on design and applications of immersion tubes suitable for industrial heating purposes. Presented along with complete information on determining heat output and other considerations of thermal efficiency.

16-62. **Vacuum System Removes Dust from Open-Hearth Flues.** *Steel,* v. 116, June 4, '45, p. 125.
Dirt from open-hearth cellars is conveyed by suction through a steel collector main to a receiving tank which empties either into a box or gondola car. Unit can be transferred from one open-hearth to another or can be installed permanently. Savings in man-hours range from 50 to 70%, based on early installations. Steam consumption varies from 1800 to 3000 lb. per hr. at 125 lb. nozzle pressure.

16-63. **A Method for Determining Electric Furnace Capacity.** John McBroom. *Steel,* v. 116, May 28, '45, pp. 128, 155.
Method to determine the size shell for any size heat.

16-64. **Infra-Red Versus Convection Heating.** Charles C. Eeles. American Gas Association *Monthly,* v. 27, June '45, pp. 281-286.
Heat transfer methods; finish types and characteristics; infra-red characteristics; heat intensity; convection characteristics; present equipment; worries are legion; future probabilities; rapid heating aim; convection ovens adaptable.

16-65. **Four-Zone Conveyor Oven.** C. A. Litzler. *Steel,* v. 116, June 11, '45, pp. 138, 141-142, 186, 188, 190.
Affords dust-free finishing of ordnance items and civilian goods, provides for minimum handling of work, obtains maximum fuel economy by full reheating and recirculating system, handles wide range of temperatures and baking times.

16-66. **Temperature Distribution and Tube Expansion in Radiant Heating Panels.** R. G. Vanderweil. *Heating and Ventilating,* v. 42, June '45, pp. 69-74.
Flow of heat throughout the panel and the problem of expansion of tubes.

16-67. **Charging Electric Steel and Other Furnaces.** *Foundry Trade Journal,* v. 76, May 17, '45, pp. 54, 55.
Minimum turning radius; choice of power; the charging bar.

16-68. **Use of Blast-Furnace and Coke-Oven Gas in Steel-Plant Furnaces.** *Industrial Heating,* v. 12, June '45, pp. 984, 986.
Article summarizes two of the prepared papers presented at Symposium of A.I.S.E., describing current practices in two plants.

16-69. **Scaling Properties of Steels in Furnace Atmospheres.** A. Preece and R. V. Riley. *Steel Processing,* v. 31, May '45, pp. 311-315.
Results obtained in a survey of the scaling characteristics of a selection of steels in furnace atmospheres at 1150° C.

16-70. **Mercury Arc Heating Frequency Converter.** S. R. Durand. *Electronic Industries,* v. 4, June '45, pp. 74-78, 150, 155.
Mercury pool unit supplying 100 or more kilowatts at several thousand cycles for induction heating and melting.

16-71. **Malleable Cast Iron.** L. S. Wilcoxson and D. F. Sawtelle. *Iron and Steel,* v. 18, May '45, pp. 177-180.
Pulverized coal firing of annealing furnaces. (American Foundrymen's Association.)

16-72. **Auxiliary Heating in Siemens-Martin Furnaces.** Gottfried Prieur. *Stahl und Eisen,* v. 64, Jan. 13, '44, pp. 21-24.
In the performance of Siemens-Martin furnaces with and without auxiliary heating in the recuperator, at the same heat consumption, an increase of at least 15% in output was obtained with auxiliary heat. This small increase in output can probably be raised considerably.

16-73. **Design and Construction of Power Plant for Steel Mills.** Karl Schröder. *Stahl und Eisen,* v. 64, Jan. 13, '44, pp. 24-29.

16-74. **Theory of Operating Blast Furnaces at High Top Pressures.** T. L. Joseph. *Blast Furnace & Steel Plant,* v. 33, June '45, pp. 699-707.
Problems of counter current flow; pressure drop through the furnace; effect of high top pressures on gas velocities and pressure drop through the furnace; calculated gas velocities with varying blowing rates at 10 lb. top pressure; effect of high top pressure on permissible blast temperatures; irregularities in gas distribution; effect of suspended particles on channeling; effect of suspended particles on the pressure drop through the bed; effect of high top pressure on the chemistry of the blast furnace process; summary of improvements indicated by a theoretical consideration of high top pressure operation; blast furnace tests on high top pressure operation. 4 ref.

16-75. **Modern Blast Furnace Design and Operation, VI.** James Dale. *Blast Furnace & Steel Plant,* v. 33, June '45, pp. 714-718.
Blowing out of furnaces; installation of tuyeres.

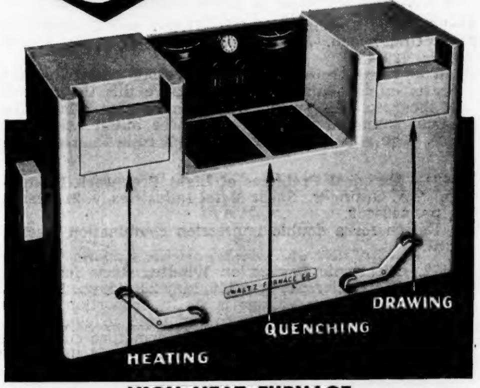
17. REFRACTORIES AND FURNACE MATERIALS

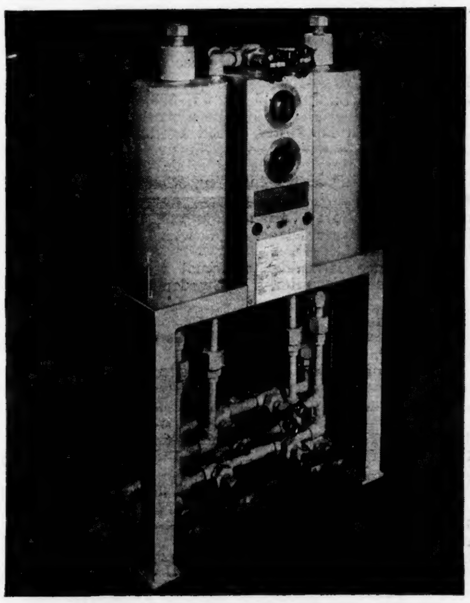
17-28. **Valves for Modern Open-Hearth Furnaces.** A. G. Arend. *British Steelmaker,* v. 11, May '45, pp. 214-217.
Use of water-seals; valves without water connections; water-cooling without water-sealing.

17-29. **Silicon Carbide Roller Hearths for High Temperature Industrial Furnaces.** Matthew L. Snodgress. *Industrial Heating,* v. 12, May '45, pp. 834, 836.
Silicon carbide rollers provide a means of conveying material through furnaces or kilns at increased efficiency due to elimination of sensible heat losses. Range of temperature, speed of material through the furnace and hearth loads are extended beyond commonly accepted practice through the use of this type of roller, and replacement and maintenance costs of roller-hearth furnaces are thereby greatly reduced.

17-30. **Density of Open-Hearth Furnace Bottoms.** Roland B. Snow. *Industrial Heating,* v. 12, May '45, pp. 838, 882-883.
Relative densities of open-hearth bottoms produced by several different methods from a variety of materials.

17-31. **Classification of Natural Organic Binders.** Edward P. McNamara and Jay E. Comeforo. *Refractories Journal,* v. 21, April '45, pp. 165-172.
Modulus of rupture, loss on tumbling, migration, water absorption, and burn-out characteristics were studied using a series of organic compounds representative of the types used as binders for ceramic materials. The results are interpreted in terms of the constitution of the organic compounds and in terms of the mechanism of specific adhesion. The binding strength of an organic material may be predicted from a knowledge of its molecular constitution.





17. REFRACTORIES (*Cont.*)

17-32. **Investigation of Refractory Material for Tapping Equipment.** L. O. Uhrus and K. Oberg. *Jernkontorets Annaler*, v. 128, no. 12, '44, pp. 597-609. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 143-A.

17-33. **Service Life of Open-Hearth Silica Brick Roofs.** *Steel*, v. 116, June 18, '45, pp. 114, 158.

Consideration of the physical conditions of open-hearth roofs and of individual bricks as well as the chemical changes which occur during service reveals that the wear of roof bricks takes place as the result of liquid flowing from considerable distance within the brick.

17-34. **Basic Bricks, II.** *Iron & Steel*, v. 18, May '45, pp. 147-149, 159.

Manufacture of stabilized dolomite bricks and cements.

17-35. **Carbon Products as Used in Various Metallurgical Applications.** *Blast Furnace & Steel Plant*, v. 33, June '45, pp. 721-724.

New carbon applications; graphite riser rods; graphite molds; graphite chill molds; mold wash; pickling tanks; heat exchangers; graphite crucibles for induction furnaces.

18. HEAT TREATMENT

18-116. **Preserving the Corrosion Resistance of Stainless Steel During Annealing or Heat Treatment.** G. C. Kiefer. *Corrosion and Material Protection*, v. 2, May '45, pp. 10-14.

Preparation and maintenance of surface prior to and during annealing are of utmost importance. It is essential to provide a final surface conditioning after all fabricating is finished. Final conditioning may be greatly facilitated by the amount of attention given the metal surface during the annealing operation. Imperative that both surface conditioning and proper annealing procedures receive careful attention. Surface conditioning; furnace conditions; annealing table shown.

18-117. **Changes in Metal Surfaces Through Cavitation.** Max Vater. *Zeitschrift für Metallkunde*, v. 26, Feb. '44, pp. 38-43.

18-118. **Changes in Volume and Electrical Resistance During the Heat Treatment of Copper-Beryllium Alloys.** Hans Thomas. *Zeitschrift für Metallkunde*, v. 36, June '44, pp. 136-140.

18-119. **Carburization and Decarburization of Steel.** *Western Metals*, v. 3, May '45, p. 36.

"No-Carb" and "No-Kase" products of considerable assistance in selecting carburization and the prevention of decarburization.

18-120. **Hardening "Moly" Hacksaw Blades.** G. W. Birdsall. *Steel*, v. 116, May 21, '45, pp. 109-110.

Improved protective atmospheres avoid decarburization. Description of furnace and atmosphere generating equipment used to harden these molybdenum hacksaw blades without scaling or decarburization finds the main point of departure in the cracking unit which employs special materials along with a catalyzing agent.

18-121. **Effect of Delayed Quench on the Strength of Alclad 24S-T Sheet.** J. E. Douglas. *Iron Age*, v. 155, May 24, '45, pp. 62-63.

Tests indicate that when solution heat treating 0.032-in. Alclad 24S-O sheet at the soaking temperature of 920° F., maximum strength is obtained if the material is soaked for a period of 20 min. and quenched in the shortest possible time. Tensile, yield and ultimate strength, and in general per cent elongation, decrease with increase in quench delay for any given soaking period.

18-122. **Heat Treatment of Steel as Related to Design, Materials and Processing.** Thomas F. O'Brien. *Metals and Alloys*, v. 21, May '45, pp. 1335-1350.

The problem; design; materials engineering; general processing and heat treatment; progress in methods and equipment; the personal equation. 33 ref.

18-123. **Methods for the Quenching of Steel, Part V.** M. H. Mawhinney. *Industrial Heating*, v. 12, May '45, pp. 760, 762, 764, 766, 768, 770.

Continuous quenching.

18-124. **Heat Treating and Finishing of Light Alloys in Wright Aeronautical Plants, II.** H. E. Linsley. *Industrial Heating*, v. 12, May '45, pp. 823-830, 832.

Describes ovens used in processing aluminum alloy parts, as for heat treating, shrink fitting, paint baking, etc.

18-125. **Nutmeg Heat Treating Co. Facilities Handle All Types of Commercial Work.** *Industrial Heating*, v. 12, May '45, pp. 850-852, 854, 856, 858.

Ferrous and non-ferrous metals are processed by induction heat treatment, flame hardening, annealing, hardening, cyaniding, air tempering, carburizing, normalizing and tool hardening.

18-126. **Maximum Carbon in Carburized Cases.** Sidney Breitbart. *Metal Progress*, v. 47, June '45, pp. 1121-1127.

Theoretical considerations indicate that the maximum carbon in a carburized case should be no higher than the A_{cm} point for the carburizing temperature, but much higher carbons are frequently found in practical operation. This discrepancy is explained by relating excess carbides in the case to the undiffused complex carbides or carbide nuclei in the steel during the carburization; undesirable surface carbides can be avoided if the steel is first converted to truly homogeneous austenite.

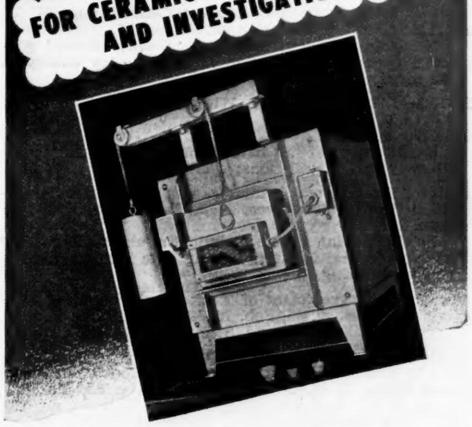
18-127. **Heat Treatment of R301 Alloy.** T. L. Fritzlen and L. F. Mondolfo. *Metal Progress*, v. 47, June '45, pp. 1128-1136.

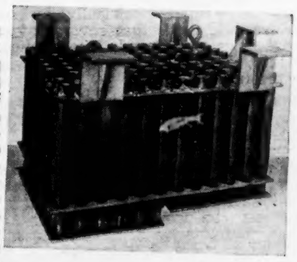
Covers heat treatment of R301 in detail; response to numerous requests for additional information on the heat treating practices and their effect on the properties.

18-128. **Individual Oil Quenches for Machine Parts.** A. R. Hotchkiss. *Steel*, v. 116, June 4, '45, pp. 122, 156.

By the pressure quench method, the advantages of a mild quenching medium are retained, more desirable physical properties are secured, a single operation setup replaces a more complicated one, and increased production is secured.

(Continued on Page 14)





18. HEAT TREATMENT (Cont.)

18-129. **Contour Hardening Steel Gear Teeth.** V. W. Sherman. *Steel*, v. 116, May 28, '45, p. 130.
Uniform, thin-case contour hardening of steel gear teeth, by the application of high frequency energy in the megacycle range.

18-130. **Salt Baths in the Wire Industry.** A. R. Stargardter. *Wire and Wire Products*, v. 20, June '45, pp. 415-419, 448-450.
Development of salt bath furnaces; equipment requisites; typical installations; cyclic annealing; descaling.

18-131. **Fundamental Principles and Applications of Induction Heating, VII.** *Sheet Metal Industries*, v. 21, May '45, pp. 837-843.
Bright flowing of electrolytic tin plate: Paint and lacquer drying; forging; heating of a mass; annealing and normalizing. 3 ref.

18-132. **Heat Treatment of Tank Track Spindles.** A. R. Page. *Machinist*, v. 88, Feb. 10, '45, pp. 281-283; Feb. 17, '45, pp. 287-288. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 153-A.

18-133. **Sub-Zero Treatment Improves Tool Life of High Speed Tools.** T. M. Snyder. *Machinist*, v. 88, March 3, '45, pp. 91-93. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 154-A.

18-134. **Localized Annealing and Hardening.** John E. Hyler. *Steel*, v. 116, June 11, '45, pp. 134, 136, 180, 182, 184.
Specialized machines for application of heat to certain areas of parts requiring treatment for protection against wear or to help retain or increase softness are described. Employing gas or electricity, these units are remarkably adaptable for production line operations. 6 ref.

18-135. **Heat Treatment of Light Metals.** *Light Metal Age*, v. 3, May '45, pp. 21, 37-38.
A bibliography.

18-136. **Beryllium - Cooper — a Heat Treatable Alloy.** M. J. Donachie. *Modern Metals*, v. 1, June '45, pp. 8-12.
Beryllium-copper, as a heat treatable alloy, has had a somewhat varied success due to a lack of uniformity in the material from the casting stage through the heat treating to the final stock. Difficulties in making proper ingots and their heat treatment which are responsible for the non-uniform physical properties and points out methods of prevention. 7 ref.

18-137. **A Survey of Dielectric Heating.** M. J. Maiers. *Electrical Engineering*, v. 64, June '45, pp. 210-211.
Materials that are poor conductors of electricity may be treated electrically by subjecting them to electrostatic fields that reverse at rates from 3 to 30 megacycles per second. The applications made so far of this form of heating promise new, improved products in the future.

18-138. **Some Aspects of the Hardening and Hardenability of Steel.** *Metal Treatment*, v. 12, Spring '45, pp. 23-28, 22.
Quench-hardening of steel has become a scientifically controlled operation. Hardening temperature specified can be accurately measured; troubles like scaling (oxidation) and the formation of a soft decarburized skin may be prevented by using a controlled furnace atmosphere or by heating tools in a bath of molten salt or in charcoal. Some aspects of the subject discussed. 6 ref.

18-139. **Isothermic Heat Treatment of Steel.** Harold J. Babcok. *Metal Treatment*, v. 12, Spring '45, pp. 29-37.
Basic principles underlying isothermal transformation, which is the transformation of steel at a constant elevated temperature as distinct from the change effected by quenching to room temperature and reheating. Practical utilization of the treatment is in such processes as "Martempering" and "Austempering." 8 ref.

18-140. **Carbonaceous Muffle Method of Atmosphere Control for Hardening High Speed Steel.** E. F. Watson. *Metal Treatment*, v. 12, Spring '45, pp. 39-42.
Carbon block method of hardening high speed steel to avoid decarburization, scale or excessive carburization.

18-141. **Salt Baths and Their Hazards.** E. G. West. *Metal Treatment*, v. 12, Spring '45, pp. 49-55.
Discusses fire risk associated with salt baths, which are used principally for the heat treatment of the light aluminum alloys.

18-142. **Induction Heating Speeds Helldiver Production.** E. K. Fry. *Aviation*, v. 44, June '45, pp. 138-140.
Details of a processing method which has done the trick on numerous brazing, production, and salvage jobs—to improve quality and expedite output of small parts for C-W Helldivers.

18-143. **Methods for the Quenching of Steel.** M. H. Mawhinney. *Industrial Heating*, v. 12, June '45, pp. 954, 956, 958, 960, 962.
Fixture and high-temperature quenching.

18-144. **Isothermal Transformation, End-Quench Hardenability and Tempering of Steels.** *Industrial Heating*, v. 12, June '45, pp. 964, 966, 968.
Tempering cobalt steels; isothermal transformation and hardenability of NE steels; new hardenability test procedure; hardenability test for low carbon steels and shallow hardening steels.

18-145. **Heat Treating Aluminum Alloy Aircraft Parts in High Speed Production Units.** *Industrial Heating*, v. 12, June '45, pp. 970, 972, 974, 976.
With this equipment, a work load of 1200 lb. of aluminum alloy can be heated from 70 to 930° F. within 25 min. if the furnace is already stabilized at this latter temperature before the load is conveyed into the heating chamber. Unusual features.

18-146. **Clean or Bright Annealing Furnace for Non-Ferrous Products.** *Industrial Heating*, v. 12, June '45, p. 982.
New furnace in which coils of silver-solder wire are clean annealed in an open-fired chamber without the need for muffles or external atmosphere-generating units. Desired atmosphere in the furnace is accurately controlled from the gas-proportioning equipment which regulates the air-gas supply to the burners.

18-147. **Miniature Elevator.** A. R. Hotchkiss. *Steel*, v. 116, June 18, '45, p. 107.
Affords precise movement through inductor block in induction hardening, ends loss of parts by arcing, produces more uniformly treated work.

18-148. **Result of Stabilizing Heat Treatment on Welded 18-8 Stainless.** Wilson G. Hubbell. *Iron Age*, v. 155, June 21, '45, pp. 56-60.
Tests carried out indicate that stabilizing treatment obtained by heating welded sections of 18-8 types 321 and 347 stainless steel for 30 min. at 1650° F. exerts some small, but inconclusively beneficial results in helping the metal resist corrosive aqueous solutions and electrolytes (Strauss test). There appears to be no justification that this type of heat treatment increases the resistance of aircraft engine exhaust manifolds to intergranular attack by exhaust gases at elevated temperatures.

18-149. **Stress Relief of Weldments for Machining Stability.** J. R. Stitt. *Welding Journal*, v. 24, June '45, pp. 331s-349s.
Determines the effect of thermal stress relief treatments, having maximum temperatures of 900, 1000, 1100, 1200, 1300 and 1400° F., upon the stabilities of weldments during machining operations. Specimens used throughout this investigation were made from four high-tensile steels; namely, NE 8630, SAE 4130, NAX-X 9115 and NAX-X 9130.

19. WORKING

Rolling, Drawing, Pressing, Forging

19-153. **Stamping Light Metals.** *Modern Metals*, v. 1, April '45, pp. 4-6.
Many firms have become familiar with working aluminum and magnesium during this war. They have produced parts to close tolerances and have found that light metals are easy to fabricate and economical to use.

19-154. **Light Metal Rolling.** O. Emicke. *Metal Industry*, v. 66, April 27, '45, pp. 263-264.
Power requirements involved in rolling light metal sheet. Results obtained from hot rolling and their applicability in practice.

19-155. **Shot-Blasting.** *Automobile Engineer*, v. 35, April '45, pp. 163-164.
Developments in the technique for increasing fatigue strength.

19-156. **Stretch-Forming Aluminum with Plastics Dies.** L. R. Miller. *Pacific Plastics*, v. 3. May '45, p. 15.
Stretch-forming aluminum has advanced in its outstanding efficiency by the use of cast phenolic dies. Utilization of cast plastics has saved hours of die fabrication and has cut time securing the desired formed part.

19-157. **Snap-Assembly Construction.** *Steel*, v. 116, May 21, '45, p. 122.
Die-formed sheets and framing in wide variety of sizes are made with special flanged edges and channels that interlock to provide unusually strong unit without space-consuming reinforcement.

19-158. **Large Extrusions Replace Forgings in Making Inner-Wing Spar Caps.** J. W. Reis. *American Machinist*, v. 89, May 24, '45, pp. 106-108.
In tests with various aluminum alloys, it was found that 75S gave the greatest strength. A close metallurgical control is kept over the large extrusions.

19-159. **Reducing Press Shop Scrap.** *Production and Engineering Bulletin*, v. 4, April '45, pp. 133-136.
Effect of lubrication, cleanliness, speed, and type of presses on drawing operations.

19-160. **Piercing Steel Tubes.** *Production and Engineering Bulletin*, v. 4, April '45, pp. 137-139.
20-ton power press adapted for the job.

19-161. **Fabrication of Wrought Aluminum Alloys in the Aircraft Industry.** Max E. Tatman and Stuart Martin. *Western Metals*, v. 3, May '45, pp. 12-14.
Technical advances in the metallurgical and metal forming fields. Development of several new high-strength aluminum alloys which have been used to increase the structural efficiency of newer aircraft.

19-162. **Steel Wire Manufacture.** *Wire Industry*, v. 12, May '45, pp. 247-248.
Raw material testing; initial patenting or conditioning heat treatment; cleaning and pickling; inhibitors; final patenting process; cold working; final patenting heat treatment.

19-163. **Nosing 8-Inch H. E. Shells on a 4500-Lb. Steam Hammer.** Alan B. Salkeld. *Industrial Heating*, v. 12, May '45, pp. 780, 782, 784, 786.
Problems in shell nosing; furnace for heating for nosing; nosing operation on the steam hammer.

19-164. **Forging and Heat Treating Engine Sections at the Transue & Williams Plant.** *Industrial Heating*, v. 12, May '45, pp. 742-744, 746, 748, 750, 752, 754, 756, 758.
Streamlined plant layout and specialized equipment applied to production of heavy aircraft engine crankcase forgings for war suggest innovations in shop planning that promise improved operating conditions, simplified handling and smoother flow of materials in peace-time plants.

19-165. **Metallurgical Aspects of Alloy Steel Aircraft Engine Forgings.** A. J. Pepin and A. L. Rustay. *Metal Progress*, v. 47, June '45, pp. 1107-1114.
Steel yard; laboratory acceptance testing; shear department; die department; forge shop; heat treatment shop; inspection and testing; salvage.

19-166. **Sheet Forming Methods; Their Effect on Part Design.** Mark P. Meinel. *Product Engineering*, v. 16, June '45, pp. 374-377.
Possibilities and limitations of 12 general methods of forming sheet aluminum parts and factors affecting selection of a suitable forming method for a specific design.

19-167. **Impact Extruded Aluminum Parts—Their Design and Production.** Marcus A Fair. *Product Engineering*, v. 16, June '45, pp. 402-406.
Impact extruded aluminum and aluminum alloy parts; features of design that can be produced, and scope and limitations of the extrusion process described to indicate when and how designers can use extrusion.

19-168. **Template Die Method Simplifies Tooling.** *Production Engineering and Management*, v. 15, June '45, pp. 73-76.
New type punch and die assembly for blanking and piercing is constructed directly from templates. Advantages in the use of template dies are elimination of machine work and reduction of tooling time.

19-169. **Iron Mortar Absorbs Vibration of Rolling Mill Equipment.** John D. Knox. *Steel*, v. 116, June 4, '45, pp. 118, 120.
Improved grout with high early compressive strength and capable of being flowed between foundation and bedplate withstands hammering action under severe operation. Dispersion agent lowers water required for cement, increasing strength and reducing amount of correction necessary in initial volume change.

19-170. **The Rolling of Metals: Theory and Experiment.** L. R. Underwood. *Sheet Metal Industries*, v. 21, March '45, pp. 429-436.
For rough rolls the slip increases somewhat for drafts up to about 2 mm. but above this the reverse is the case. For smooth rolls the slip has almost the same maximum value for the three initial heights of bar. The slip is greater for rough rolls than smooth. 17 ref.

19-171. **Practical Problems of Light Presswork Production.** J. A. Grainger. *Sheet Metal Industries*, v. 21, March '45, pp. 449-452.
Design for a double impression combination washer tool.

19-172. **Electronic Devices on Winding Reels for Metal Strip.** J. H. Hopper. *Steel*, v. 116, May 28, '45, pp. 132, 135.
Motor armature voltage is set in proportion to line speed which in turn can be regulated to conform to different gages of strip. Constant armature current is maintained as the size of coil increases and the motor slows down, thus providing constant tension on the strip during winding operation.

19-173. **Forging Die Design.** John Mueller. *Steel Processing*, v. 31, May '45, pp. 299-301.
Fabricating methods used to manufacture different types of forged hooks.

19-174. **Mass Production of Aircraft Expanded Through Increased Use of Stampings.** *Steel Processing*, v. 31, May '45, pp. 302-304.
Results giving comparative analysis between the conventional method (machining an aluminum alloy forging) and an alternate method (a steel stamping).

19-175. **Heating Furnaces in New Oldsmobile Forge Plant of Modern Design and High Capacity.** *Industrial Heating*, v. 12, June '45, pp. 928-930, 932-934, 936-938, 940, 942, 944.
Covers the equipment installed in the hammer shop, and describes the hammers, heating furnaces and other equipment employed in forging bomber parts, axles for transport equipment and miscellaneous forgings.

19-176. **Soft Dies—Hard Jobs.** Fred P. Peters. *Scientific American*, v. 172, June '45, pp. 357-358, 360.
Developed originally by the aircraft industry to improve design flexibility, speed production, and lower die cost for short-run work, the use of zinc alloy dies for sheet-metal forming has established itself as permanent tooling and is invading other fields as well.

19-177. **Energy Consumption in Hot Rolling.** G. Wallquist. *Jernkontorets Annaler*, v. 128, 1944, pp. 249-306, 309-369. *Engineers' Digest* (American Edition), v. 2, May '45, pp. 232-236.
Reference is made to actual tests and operating experiences encountered in Sweden and in other countries.

19-178. **The Rolling of Metals: Theory and Experiment.** L. R. Underwood. *Sheet Metal Industries*, v. 21, May '45, pp. 806-809.
Effect of tension on forward slip when rolling non-ferrous strip; backward slip; variation of the no-slip angle across the bar or sheet; possibility of the neutral point being in reality a neutral zone. 53 ref.

19-179. **Practical Problems of Light Presswork Production.** J. A. Grainger. *Sheet Metal Industries*, v. 21, May '45, pp. 819-820.
Ejecting the product; use of air for removal of product from the press.

19-180. **New Wire Rewinding Equipment Triples Production.** P. Somerville, L. R. Hunt, and J. C. Campbell. *Steel*, v. 116, June 11, '45, pp. 144, 147, 192.
Mechanical improvements on wire rewinding lines and adoption of electronic control of drive result in an increase in wire speed to bobbins as well as a constant wire speed throughout full bobbin buildup. New and old methods of bobbin winding compared.

19-181. **Wire Drawing.** *Metal Industry*, v. 66, May 11, '45, pp. 295-296.
Production of shaped sections in brass and copper.

19-182. **Fabrication of 75S—Ultra Strength Aluminum Alloy.** Gilbert C. Close. *Light Metal Age*, v. 3, May '45, pp. 8-11.
Processing methods for the new high strength aluminum alloys 75S.

19-183. **Rolling Aluminum Sheet at Trentwood.** Roy Fellom, Jr. *Light Metal Age*, v. 3, May '45, pp. 12-13.
Pictorial presentation.

19-184. **A Unique Method of Developing and Applying Time Standards to Parts Formed on Conveyor Table Single-Action Hydro Presses.** Ralph Sumner. *Modern Industrial Press*, v. 7, May '45, pp. 36, 38.
Method is limited to parts all of which are approximately the same size.

19-185. **The Pressing of Sheet Metal.** A. W. Swift. Junior Institution of Engineers *Journal*, v. 55, Feb. '45, pp. 109-135. Iron and Steel Institute *Bulletin*, no. 112, April '45, p. 150-A.

19-186. **Shearing.** Wm. C. Tucker. *Machine Tool Blue Book*, v. 41, June '45, pp. 147-148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170.
Confined primarily to the process of straight shearing.

19-187. **Light-Alloy Rolling-Stock.** *Light Metals*, v. 8, May '45, pp. 222-245.
Review of world practice during the period 1910-1940. 32 ref.

19-188. **Intermittent-Acting Mills for Rolling Strip.** J. D. Keller. *Steel*, v. 116, June 18, '45, pp. 108-109, 120, 123, 126.
Operating principle differs from conventional mills in that roll motion and pressure are produced by action of reciprocating cam plates. Delivery speed of Krause mill ranges from 25 to 30 ft. per min. Lateral spreading and cracking of edges are low under heavy reduction.

19-189. **Phantom Laminations.** D. R. Hull, H. F. Silliman, and J. R. Freeman. *Metal Industry*, v. 66, June 1, '45, pp. 338-341.
Sheets used for cartridges for rifles or artillery charges do not receive the same degree of rolling and annealing as do normal brass sheets. A type of "ghost" defect appears in the thicker materials which is attributed to insufficient annealing. (From A.I.M.E.)

19-190. Bar and Tube Straightening. Walter Siegerist. *Iron and Steel*, v. 18, May '45, pp. 160-163.

Theory and methods of modern two, four and six-roll equipment.

19-191. Drawing Aluminum Containers for 5-inch Naval Cartridges. G. B. A. *Machinery* (London), v. 66, May 10, '45, pp. 501-504.

Stages in the production of drawn aluminum shells having a length-to-diameter ratio of six. Thickness of the original blank was maintained during most of the drawing stages.

19-192. Consolidation of the Surface Layer Through Pressure. O. Foppl. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 556-557.

20. MACHINING AND MACHINE TOOLS

20-173. Modern Machine Tools. *Aircraft Production*, v. 7, March '45, pp. 142-143.

Centerless grinding; profile milling; cam-cutting.

20-174. Care of Carbide Tipped Milling Cutters. *Production and Engineering Bulletin*, v. 4, April '45, pp. 140-142.

Hints for storage, handling and maintenance.

20-175. Precision Grinding. *Automotive Engineer*, v. 35, April '45, pp. 152-154.

Internal grinder with equipment for finishing external diameters and faces.

20-176. Wartime Milling at Climax. *Mining World*, v. 7, May '45, pp. 15-19.

Experience with coarse grinding and new reagents during the war period has resulted in improved metallurgy at Climax.

20-177. High-production Broaching. *Machinery* (London), v. 66, April 12, '45, pp. 389-393.

Number of unusual examples of broaching machine applications illustrated and described.

20-178. General-Purpose Drilling Jig for Small Levers. C. H. *Machinery* (London), v. 66, April 12, '45, p. 393.

General-purpose fixture suitable for drilling taper-pin, set-screw or pinch-bolt holes.

20-179. Unusual Operations on Duplex Slot-Milling Machines. H.H.P. *Machinery* (London), v. 66, April 12, '45, pp. 395-387.

Duplex slot-milling machine can readily be adapted, with exceedingly accurate results, for turning and boring a wide variety of components.

20-180. Speeding-up Hand Drilling. *Machinery* (London), v. 66, April 12, '45, pp. 398-399.

Simple attachments give increased output and reduce fatigue.

20-181. Jig for Drilling Sheet-Metal Components. D. D. Morgan. *Machinery* (London), v. 66, April 12, '45, p. 402.

Drill jig designed for drilling, on five sides, component fabricated from 1/32-in. thick sheet steel.

20-182. A Master Assembly-Fixture Tooling Dock. Harry Wilkin Perry. *Aircraft Engineering*, v. 17, April '45, pp. 118-121.

Mechanical means for positioning the locators on assembly fixtures in strict accordance with loft and under the dimensional control of templates derived therefrom. And it provides physical means for projecting flat master layouts into the third dimension without loss of accuracy.

20-183. The Importance of Attention to Jig Details. H. Moore. *Aircraft Engineering*, v. 17, April '45, p. 122.

Points out that proper attention to details is not only desirable but imperative if the fullest possible advantage is to be gained from their use. The perfect drill jig is the one that can be operated with the least amount of effort and the fewest number of movements. Adoption of any of the ideas described will contribute helpfully towards making jig work easier and more profitable than it has ever been before.

20-184. Milling of Enamels. A. Biddulph. *Foundry Trade Journal*, v. 75, April '45, pp. 343-345.

Milling of frit is a combination of impact and attrition.

20-185. High Speeds With Carbide-Tipped Cutters. *Edgar Allen News*, v. 23, May '45, pp. 433-434.

Principles briefly explained.

20-186. The Machining of Steel. F. C. Lea and W. Medway. *Edgar Allen News*, v. 23, May '45, pp. 435-436.

Coolants; cutting-tool steels and their heat treatment.

20-187. Unusual Machining Operations. *Steel*, v. 116, May 21, '45, p. 128.

Required to produce parts for jet propulsion engines.

20-188. Indexing Fixtures Permit Unusual Turret Lathe Operations. *American Machinist*, v. 89, May 24, '45, pp. 116-118.

In one set-up 24 cuts are taken on a single piece; in another set-up three pieces are indexed and machined at once.

20-189. Tool Data for Precision Boring—I and II. Bruno Holmstrom. *American Machinist*, v. 89, May 24, '45, pp. 137, 139.

Details of set-ups for precision boring.

20-190. Mechanics of the Metal Cutting Process. I. Orthogonal Cutting and a Type 2 Chip. M. Eugene Merchant. *Journal of Applied Physics*, v. 16, May '45, pp. 267-275.

Analysis of the chip geometry and the force system found in the case of orthogonal cutting accompanied by a type 2 chip has yielded a collection of useful equations which make possible the study of actual machining operations in terms of basic mechanical quantities. The shearing strain undergone by the metal during the formation, and the velocities of shear and of chip flow are among the geometrical quantities which can can be quantitatively determined. The force relationships permit calculation of such quantities as the various significant force components, stresses, the coefficient of friction between chip and cutting tool, and the work done in shearing the metal and in overcoming friction on the tool face.

20-191. Step Shafts Made on Contouring Lathe. Clarence Johnson. *Tool & Die Journal*, v. 11, May '45, pp. 99-102.

Economical method for the manufacture of step shafts using an 18-in. lathe equipped with a Bailey contour control. Cutting operation is automatic.

20-192. Line Boring Fixture. Alex S. Arnott. *Tool & Die Journal*, v. 11, May '45, pp. 103-106.

Designed to produce small quantity of castings, to perform the boring operations economically without the use of a boring machine, and to avoid changing the setup of the work until all the line boring operations have been completed.

20-193. Influence of Applying Cutting Fluids at Different Temperatures When Turning Steel. O. W. Boston, W. W. Gilbert, and R. E. McKee. American Society of Mechanical Engineers *Transactions*, v. 67, May '45, pp. 217-224.

Results of an investigation to determine the influence on cutting speed, tool life, chip formation, and other pertinent factors, of a cutting fluid applied at each of several different constant temperatures, ranging from 55 to 150° F. A sulphurized mineral oil and an emulsion, consisting of 1 part soluble oil and 20 parts water, were used as cutting fluids.

20-194. A Thermal-Balance Method and Mechanical Investigation for Evaluating Machinability. A. O. Schmidt, W. W. Gilbert and O. W. Boston. American Society of Mechanical Engineers *Transactions*, v. 67, May '45, pp. 225-232.

Results of an investigation of a calorimetric process for the determination of drilling forces. Description of the machine used and the tests made prior to the investigation with the calorimetric apparatus. 22 ref.

20-195. An Analysis of the Milling Process, II—Down Milling. M. E. Martellotti. American Society of Mechanical Engineers *Transactions*, v. 67, May '45, pp. 233-251.

Down milling compared with up milling on the basis of geometric characteristics such as length of tooth path, radius of curvature, thickness of the undeformed section of the chip, chip formation, character of the milled surface, power required in cutting S.A.E. 1112 steel and cast iron, and intensity of vertical and horizontal components of the cutting force obtaining for various depths of cut. Typical mechanical backlash-eliminating devices for the feeding mechanisms of milling machines to permit downmilling operations described. Results obtained in actual application of down milling together with information on cutter life and production.

20-196. Helical Taper Reamers Milled with Constant Helix Angle. Thomas F. Githens. American Society of Mechanical Engineers *Transactions*, v. 67, May '45, pp. 303-308.

Process of milling helical flutes on a taper reamer so that the flute will have a constant helix angle of 45° at every point along the length of the reamer. The problem is solved by the development of a former or master cam cylindrical in shape and bearing upon its lateral surface a helical groove such that, as the cylinder turns on its axis with constant angular velocity, the whole former advances in the direction of its own axis at a controlled but variable speed. The milling cutter is mounted so that its plane forms a constant angle with an element of the taper blank being machined to form the reamer. The advantage of the method described is its adaptability to a quick practical solution either mathematically or by graphical means.

20-197. Time Allowances for Multple Spindle Drilling. *Iron Age*, v. 155, May 31, '45, pp. 50-54.

Operation standards for multiple drilling to assure fixed cost factors, to give productive supervision a method of control in maintaining uniform operating and machining conditions, and to facilitate arrival at proper time allowances in establishing uniform piece work rates.

20-198. Grinding Corrected Angles on Dovetail Forming Tools. Charles L. Hall. *Production Engineering and Management*, v. 15, June '45, p. 87.

Simple time-saving formula to establish the correct angle to employ when redressing the grinding wheel. Accuracy when regrinding is assured.

20-199. Thread Gaging with Cemented Carbides. *Production Engineering and Management*, v. 15, June '45, pp. 88-89.

Savings of more than 80% below estimated cost, the elimination of a serious burden in the tool room, and an exceptionally long life expectancy are among the advantages claimed for carbide thread gages.

(Continued on Page 16)

20. MACHINING *(cont.)*

20-200. **Savings Effected by Improved Tip Design** Joseph F. Allen. *Production Engineering and Management*, v. 15, June '45, p. 99.

Reduced grinding time and better utilization of carbide are claimed for this method of applying tips to cutters. Negative or positive rakes are possible and use of chip breaker groove is optional.

20-201. **Trouble Shooting Problems in Steel Machining.** J. H. Greenberg. *Metal Progress*, v. 47, June '45, pp. 1115-1119.

Points tabulated in a trouble chart; remedies apply only when all other factors are under control and approximately right. One must not change tools, cutting oil, heat treatment all at once, nor should the metallurgist insist that hardness or microstructure or both is the one criterion of machinability.

20-202. **Grinding in Foundries.** C. A. Carlson. *Foundry*, v. 73, June '45, pp. 95, 250, 252, 254, 256, 258.

Grinding wheel behavior on cast iron. With few exceptions grinding is done with silicon carbide wheels vitrified or resinoid bonded. Essential factors to be considered in choosing grinding wheel specifications.

20-203. **Tooling the Automatic Screw Machine, XIII.** Noel Brindle. *Modern Machine Shop*, v. 18, June '45, pp. 124-132, 134, 136.

Slotting attachment and its use.

20-204. **Ideas From Readers.** *Modern Machine Shop*, v. 18, June '45, pp. 170, 172, 174, 176, 178, 180, 182, 184, 186.

Index collet milling fixture. Swinging clamp fixture. Connecting thin-wall tubing to pipe. "Turning the table" of decimal equivalents.

20-205. **Forging and Machining Track Links for Army Tanks.** Charles O. Herb. *Machinery*, v. 51, June '45, pp. 137-147.

Methods for producing all-steel links for the tracks of tanks.

20-206. **Basic Methods of Thread Grinding.** W. J. Grimm. *Machinery*, v. 51, June '45, pp. 148-153.

Principles in present thread grinding practice with single-edge and multi-edge wheels.

20-207. **Selection of Cutting Fluids.** James R. Chambers. *Machinery*, v. 51, June '45, pp. 154-156.

Characteristics of coolants and cutting fluids generally used in industry, and cutting fluids most suitable for different materials.

20-208. **Reducing Scrap by Precautions Taken Before Starting to Grind.** R. E. Price. *Machinery*, v. 51, June '45, pp. 162-164.

Many grinding difficulties are the result of overlooking some very simple precautions.

20-209. **Precision Boring for Accuracy of Roundness and Concentricity.** Berkeley Williams. *Machinery*, v. 51, June '45, pp. 165-168.

Work performed on a Heald Bore-Matic for obtaining concentricity of machined surfaces.

20-210. **Ingenious Mechanical Movements.** L. Kasper. *Machinery*, v. 51, June '45, pp. 173-174.

Mechanisms selected by experienced machine designers; applicable in the construction of automatic machines and other devices.

20-211. **Securing Diamonds in Wheel-Dressing Tools.** Harry L. Strausse, Jr. *Machinery*, v. 51, June '45, p. 179.

Methods by which the diamonds are secured in tools are brazing, casting, powder metallurgy, and induction heating. Advantages and disadvantages of these methods.

20-212. **"Butterfly" Case.** G. W. Birdsall. *Steel*, v. 116, June 4, '45, pp. 104-106.

Ingenious jigs and fixtures devised to facilitate assembly operations in production of unique bomb containers; springs preloaded before assembly.

20-213. **Lathe Attachments.** Robert Mawson. *Steel*, v. 116, June 4, '45, p. 111.

Transform special machining job into production operation, permitting work formerly requiring highly skilled operators to be handled on simple repetitive basis.

20-214. **Practical Ideas.** *American Machinist*, v. 89, May 24, '45, pp. 119-124.

Master arbor for gear cutter uses interchangeable work holders. Stepped tap rechases mutilated threads. Copper-lined lathe dog holds finished metal parts safely. Damaged screws removed by follow-up screwdriver. Accurate radius filing obtained by laying out gage lines. Universal fixture for bending bar stock to shapes. Leveling bar aids set-up of bored castings on shaper. Motor-driven rotary file support improves workmanship. Accidents prevented by use of transparent guard. Good grip and more force applied with extra handle on large file. Puller for small bearings removes sleeves without damage. Pusher removes small pins without bending shafts. Fixture holds washer and pin square while riveting. Hose fittings crimped by use of hand-operated pliers.

20-215. **Flow Reconditioning of Machine Tools.** *Machinery* (London), v. 66, April 19, '45, pp. 417-423.

Methods used in rebuilding Brown & Sharpe automatics.

20-216. **Machine Equipped to Hob Internal Gears.** L. A. and J. S. *Machinery* (London), v. 66, April 19, '45, p. 431.

Gear-hobber equipped to cut internal involute gears accurately, rapidly, and economically. Fixture has a special geared drive, and is mounted on the swivel head of a 160-in. gear hobbing machine.

20-217. **Automatic Broaching Setup.** G. W. Birdsall. *Steel*, v. 116, May 28, '45, pp. 110-112.

Cuts involute internal teeth to full depth on stack of clutch disks. After loading in fixture, machine automatically moves fixture to cutting position, indexes to make series of nine cuts, and returns for unloading.

20-218. **Favored Practice in Machining Zinc Alloy Die Casting. Part 5.** *Die Casting*, v. 3, May '45, pp. 66, 68, 70.

Broaching and shaving; shaving dies; grinding and polishing.

20-219. **Factors in the Application of Carbide Cutters.** *Machinery* (London), v. 66, May 3, '45, pp. 482-484.

Operating precautions; multiple cutter mounting; cutter location in relation to work; speed; feed; number of teeth and power; flycutting.

20-220. **Carbide Hobs for Cutting Marine Propulsion Gears.** A. J. Kroog and R. W. Righter. American Society of Naval Engineers *Journal*, v. 57, May '45, pp. 268-271.

Purpose is to develop interest of gear manufacturers toward increasing the quantity and improving the quality of marine propulsion gears. Possibilities of high productive hobs.

20-221. **Some Suggestions on the Fabrication of Stainless Steels.** Paul F. Voigt. *Steel Processing*, v. 31, May '45, pp. 294-298.

Machining; milling; drilling; tapping; threading; sawing; shearing; deep drawing; spinning; finishes; grinding; polishing; buffing.

20-222. **Electronic Torque Control Prevents Drill Breakage.** *Machinery* (London), v. 66, May 10, '45, pp. 507-508.

Electronic control that automatically backs out the drill when torque exceeds a given amount. The device can be set to operate on as low as 1% increase in torque load on the drill spindle.

20-223. **Simplified Change Gear Calculations.** A. J. Mantell. *Machinery* (London), v. 66, May 10, '45, pp. 510-511.

Attempt to assist the turner in solving the gearing problems which occur in thread cutting on a center lathe with a self-contained gear box, to a lead or pitch which is not to be found on the index plate usually attached above the gear-box.

20-224. **Carbide-Tipped Milling Cutters.** *Aircraft Production*, v. 7, May '45, pp. 232-233.

Hints for storage, handling and maintenance.

20-225. **Centerless Thread Grinding.** *Aircraft Production*, v. 7, May '45, pp. 234-237.

New Landis development which is claimed to increase quality and reduce production times.

20-226. **Modern Machine Tools.** *Aircraft Production*, v. 7, May '45, pp. 251-253.

Billet turning; crankcase facing; face-milling light alloys; slab milling; keyseating.

20-227. **Negative Rake Machining.** *Aircraft Production*, v. 7, May '45, pp. 254-255.

When used under correct conditions, considerable savings can be effected by the new technique. (From American Society of Mechanical Engineers.)

20-228. **Diamond Cutting Tools.** Paul Grodzinski. *Mechanical Engineering*, v. 67, June '45, pp. 369-379.

Present-day application; fundamentals of diamond as a cutting material; cutting-tool nomenclature; plane of chip flow; selection and orientation of diamond; optimum tool shape; setting of the diamond; angular adjustment of diamond tools. 23 ref.

20-229. **Radial Rake Angles in Face Milling.** J. B. Armitage and A. O. Schmidt. *Mechanical Engineering*, v. 67, June '45, pp. 403-406.

Cutter characteristics; effect of negative radial rake angles on tool life and power consumption at the cutter.

20-230. **Favored Practice in Machining Zinc Alloy Die Casting, VI.** *Die Casting*, v. 3, June '45, pp. 60, 62, 64.

Buffing; burnishing and tumbling.

20-231. **Negative Rake Turning and Boring.** *Machinery* (London), v. 66, May 17, '45, pp. 529-535.

Tools described were designed for a particular operation on a specific product which was to be machined on a certain machine. Success of particular tool angles and radii employed depends a great deal on the machine. Reasons why negative-rake carbide turning and boring tools possess desirable advantages.

20-232. **Preferred Numbers and Machine Tool Speeds.** Geo. Schlesinger. *Machinery* (London), v. 66, May 17, '45, pp. 540-543.

Tables which show the application of preferred numbers to the speeds of machine tools.

20-233. **Machining of Ferrous and Non-Ferrous Materials.** J. W. Donaldson. *Metal Treatment*, v. 12, Spring '45, pp. 3-12.

Machinability can be controlled within certain limits. Discusses the general question, including progress made in the technique of making small percentage additions of particular elements to both ferrous and non-ferrous metals in order to improve machinability. The composition of tool steels is considered in this connection, and the effects of heat treatment on certain alloy steels and aluminum alloys, together with the influence of structure and grain size. Several tables demonstrate what has been done to facilitate machine-shop operations. 15 ref.

20-234. Improved Milling System Decreases Cutter Inventories and Costs. Arthur A. Schwartz. *American Machinist*, v. 89, June 7, '45, pp. 99-102.
Interchangeability of elements and basic simplicity are the means of attaining increases in over-all efficiency permitted by the use of this new system.

20-235. Precision Bevel Gears Cut Quickly. Ernest Wildhaber. *American Machinist*, v. 89, June 7, '45, pp. 106-109.
Revacycle process produces finely finished teeth eased off at their ends to any desired amount.

20-236. Friction Sawing Proves Faster in Cutting Parts From Plate. R. C. Holloway. *American Machinist*, v. 89, June 7, '45, pp. 113-114.
Conversion of a conventional bandsaw to friction sawing was not undertaken as a stunt; if an operation yields only a few pieces per hour, a production-minded executive gets busy.

20-237. Practical Ideas. *American Machinist*, v. 89, June 7, '45, pp. 115-120.
Rotating quadrant seam welds inside and outside curves. Three-point contact centers tubes and bars for machining. Bandsaw roller guides increase accuracy and reduce breakage. Exhaust hood on rivet gun makes grip comfortable. Targets establish coordinates for laying out large assemblies. Angles clamp holds sheets for welding sharp corners. Wedge roller ratchet replaces ratchet and pawl feed. Spring-cushioned cases preserve instruments against shock. Carbide inserts improve centerless grinder workrest. Billet chuck makes handling large bars more convenient. Torch tips reconditioned by machining new seats. Circular forming tools machine accurate grooves in pistons.

20-238. Tooling Ways Locates Points in Space. *American Machinist*, v. 89, June 7, '45, pp. 122-124.
Operating on the same principle as the master dock, the tooling ways can be used in making small and accurate mock-ups, and for light plane and car structures.

20-239. Foreign Standards for Metric Threads Vary in Many Details. John Gaillard. *American Machinist*, v. 89, June 7, '45, pp. 133-136.
Potential makers of goods for export should take into account that thread standards of metric countries are not in agreement upon tolerances, crest clearance and pitch-diameter progression.

20-240. Surface-Finish Chart for Precision Turning and Boring. Bruno Holmstrom. *American Machinist*, v. 89, June 7, '45, p. 137.
Employed to predetermine the combination of tool radius and lead that will realize the desired Abbott profilometer reading for non-ferrous metals.

20-241. Surface-Speed Chart for Precision Boring. Bruno Holmstrom. *American Machinist*, v. 89, June 7, '45, p. 139.
Proves helpful in connection with selecting the surface speed.

20-242. How Stainless Steel Is Machined at Roebling's. *American Machinist*, v. 89, June 7, '45, pp. 175-177.
Correct control brings results in quantity production of aircraft cable fittings; tolerances of 0.0005 in. maintained; importance of power, speed, feed, tool angles, coolants.

20-243. Setup Charts for Automatic Screw Machines. John J. Meadows. *Iron Age*, v. 155, June 14, '45, pp. 54-60.
By graphical methods, problems involving speeds and feeds can be solved in a fraction of the time necessary to make the calculations from handbooks. Eleven charts presented for various sizes of Acme-Gridley screw machines.

20-244. The Art of Metal Cutting. *Machine Tool Blue Book*, v. 41, June '45, pp. 179-180, 182, 184, 186, 188, 190, 192, 198, 200, 202, 204, 206.
Converting to carbide tooling.

20-245. Maximum Results from the Borizing Process. C. G. Nordmark. *Machine Tool Blue Book*, v. 41, June '45, pp. 213-214, 216, 218, 220, 222, 224.
First of a series of articles telling of proved shop methods which obtain the utmost in accuracy and surface finish, on a high production basis, by means of the "fly-cutting" technique.

20-246. Setup Charts for Automatic Screw Machines. John J. Meadows. *Iron Age*, v. 155, June 21, '45, pp. 62-66.
Six charts for the graphic solution of problems involving speeds and feeds, tapping and high speed drilling change gear ratios for Conomatic 2⅝-in. screw machines.

20-247. Progress Report on Carbide Hobs. Alfred J. Krogg and Richard W. Righter. *Iron Age*, v. 155, June 21, '45, pp. 67-69.
Tests made at the Joshua Hendy Iron Works, Sunnyvale, Cal., on carbide hobs for cutting marine propulsion gear teeth. Data indicate that, with a specially modified hobbing machine, a steel pinion of 285 Brinell hardness can be cut successfully at speeds of around 200 ft. per min. with a 6-in. diameter hob.

21. LUBRICATION AND FRICTION; BEARINGS

21-41. Demulsifiers in Circulating Oil Systems. T. G. Roehner and E. S. Carmichael. *Iron & Steel Engineer*, v. 22, May '45, pp. 62-68.
Persistent water-in oil-emulsions which occur in circulating systems can be broken down by a demulsifying additive . . . such agents should be chosen and used with care.

21-42. Thermal Stability Method of Evaluating Engine Oils and Relation to Piston Ring Sticking. *Automotive Industries*, v. 92, May 15, '45, pp. 30-32, 102, 104.
New method of evaluating the piston ring sticking tendencies of aircraft engine oils involves the correlation of thermal stability of an oil, and ring sticking conditions.

21-43. Lubrication. *Automobile Engineer*, v. 35, April '45, p. 165.
Notes on the use of additives.

21-44. Bearing Developments. P. T. Holligan. *Foundry Trade Journal*, v. 75, May 3, '45, pp. 3-9.
Tracing the developments of bearings from the original gun metal bearings. Gun metal; phosphor bronze; the disadvantages of gun metal; alternative specifications; leaded gun metals; lead bronzes; graphitic cast iron shafts; foundry problems with bearing metals; steel shells; copper-lead lining; practical use; crankshaft hardness; sintered copper lead and lead bronze; tri-metal.

21-45. Factors Causing Lubricating Oil Deterioration in Engines. R. E. Burk, E. C. Hughes, W. E. Scovill, and J. D. Bartleson. *Industrial & Engineering Chemistry* (Analytical Edition), v. 17, May '45, pp. 302-309.
Deterioration of lubricating oil in internal combustion engines due largely to oxidation reactions. These reactions are primarily catalytic at the engine temperatures in question, the catalysts being metals and metal compounds such as iron, copper, lead, and their compounds. Laboratory test procedure for evaluating the service stability of oils in which an attempt was made to develop a set of conditions and catalysts which duplicate those of the present Chevrolet engine test. Degrees of reproducibility and of correlation with engine results are shown in detail. 16 ref.

21-46. Rotating-Load Bearings. Arthur F. Underwood. *Automotive Industries*, v. 92, June 1, '45, pp. 26-28, 60, 64.
Concept of operation and a frictionless support.

21-47. Universal Gear Lubricants. Paul V. Keyser. *SAE Journal*, v. 53, June '45, pp. 341-344.
There is no laboratory test or combination of tests that will accurately predict the ability of a lubricant to protect gears under all conditions of operation. It will be necessary to define lubricants in terms of simulated service tests. CRC and the Army have developed two service evaluation tests that appear to give, jointly, a good measure of the dual, speed-pressure function.

21-48. Galling and Seizing. *Metallurgia*, v. 31, April '45, pp. 315-316.
Study of friction galling and seizing of metal surfaces sliding in contact one with another by the Meehanite Research Institute of America, Inc.

21-49. Bearing Developments. P. T. Holligan. *Foundry Trade Journal*, v. 76, May 10, '45, pp. 31-35.
Bearings for cast iron crankshafts; aluminum base metal bearings; tin to copper ratio; emergency properties; overseas practice; silver bearings; use of indium; bearings for railway wagons.

21-50. Bearing Down on Friction. Edwin Laird Cady. *Scientific American*, v. 172, June '45, pp. 336, 338, 340.
Certainty of action under varying conditions, plus savings in power, are two of the ways in which antifriction bearings are making for faster and more accurate production in American industry. To gain these great advantages, scrupulous maintenance is needed.

21-51. Centralized Lubrication Simplifies Press Maintenance Problems. Harry W. Tompkins. *Modern Industrial Press*, v. 7, May '45, pp. 27-30, 32.
Advantages summarized.

21-52. Ball Bearing Versatility. H. F. Williams. *Machine Tool Blue Book*, v. 41, June '45, pp. 231-232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252.
Deals with applications in which balls alone are featured—made not only of steel but several other materials.

21-53. Lubrication Needs for Machines Indicated by Color Code System. W. H. Helms. *American Machinist*, v. 89, June 7, '45, pp. 110-112.
Systematic lubrication program preserves the life of equipment. Colored symbols are used to show the various oil and grease requirements.

22. JOINING

Welding; Brazing; Flame Cutting; Riveting

22-275. Welding Under Water. Edward T. Forey. *Welding*, v. 13, April '45, pp. 97-102.
Under-water arc welding for development of an important new process.

22-276. Seam Welding. R. W. Ayers. *Welding*, v. 13, April '45, pp. 103-110.
Electric resistance welding with rollers. Comprehensive survey of the seam welding process; describes the types of machines employed, the controls used and outlines some applications and procedures adopted.

22-277. Oxygen Cutting of Bevels. *Welding*, v. 13, April '45, pp. 111-114.
Bevel gage insures accuracy.

22-278. Some Considerations in the Design of Class I Pressure Vessels. C. J. Heeley. *Welding*, v. 13, April '45, pp. 117-124.
Characteristics of Class 1 pressure vessels, the requirements of four leading authorities, the strength of welded joints and the suitable design of such joints. (From Institution of Mechanical Engineers.)

22-279. The Measurement of Welding. *Welding*, v. 13, April '45, pp. 127-129.
Slide rule to simplify costing.

22-280. New Type of Welded Truss. *Welding*, v. 13, April '45, pp. 130-131.
Simplicity of design and easy fabrication.

22-281. Sequence Control for Automatic Riveting. Walter Mandel. *Automotive Industries*, v. 92, May 15, '45, pp. 42, 116, 118, 120.
Electronic sequence control unit for automatic riveting for increasing the efficiency of Model 2002 Erco riveters.

22-282. Pressure Welding. A. R. Lytle. *Steel*, v. 116, May 21, '45, pp. 115-116, 118, 120, 152, 154, 156, 158, 160, 162.
New oxy-acetylene method makes welds by coalescence of grains across weld interface at subfusion temperatures under controlled temperature and moderate pressure. Its efficacy as a joining medium for overland pipelines, railroad rails, oil-well tool joints, drill and spring steel, stainless, and even low carbon plate, demonstrated by results of tests and case histories reported.

22-283. Conveyorized Welding of Hardenable Steel. C. W. Handova. *Iron Age*, v. 155, May 24, '45, pp. 53-55, 130.
Requirements for mass production of grousers or treads for the amphibious "Water Buffalo" met by the installation of a conveyor line with eight welding stations. Passing the tack welded assemblies first through a preheating furnace solved the problem of holding the preheat temperature within a narrow range, best suited for N-A-X 9130 high tensile steel.

22-284. Brazing Fixture Speeds Repair of Broken Milling Cutters. *American Machinist*, v. 89, May 24, '45, p. 109.
An equalizing fixture which mates pieces properly.

22-285. Selection and Application of Fastening Devices. *American Machinist*, v. 89, May 24, '45, pp. 125-136.
Threads; fits; materials of manufacture; heads and recesses; studs; self-tapping and drive screws; special types of screws; machine, set and cap screws; nuts and bolts; washers; locking devices; lock nuts; lock washers; clinch nuts; preassembled bolts and washers; other locking arrangements; manufacture of threaded fasteners; tools for application; special spring-type fasteners; rivets; special rivets; quick-access fasteners; temporary fasteners.

22-286. Magnesium Alloy Fabrication. J. V. Winkler. *Metal Industry*, v. 66, April 27, '45, pp. 261-262.
Joining practice for magnesium alloys closely follows that for aluminum alloys, riveting being the most widely used method. High strength bonding cements may be available in the near future. (From American Society for Metals.)

22-287. Welding Aluminum Structures. W. J. Conley. *Modern Metals*, v. 1, April '45, pp. 14-16.
Automatic arc welding is being employed in increasing amounts in volume fabrication of aluminum structures. Method is economical and produces strong, leak-proof seams. Examples of the process.

22-288. Gas-Shielded Arc Welding. *Aircraft Production*, v. 7, March '45, pp. 122-125.
Survey of recent developments in the atomic-hydrogen, argon and helium-shielded processes for welding stainless steel and the light alloys.

22-289. Spot-Welding. *Aircraft Production*, v. 7, March '45, p. 150.
New Sciaky heavy duty equipment designed specially for light alloy work.

22-290. Aluminum Welding by Multi-Arc. C. W. Steward. *Aluminum & Magnesium*, v. 1, May '45, pp. 20-22, 29, 34.
Multiple arc welding makes possible the welding of some alloys previously considered unweldable, eliminates most of the objectionable features of existing processes and make possible the welding of aluminum and other non-ferrous alloys with little experience.

22-291. Improving the Weldability of High Strength Low Alloy Steels. S. L. Hoyt, C. E. Sims and H. M. Banta. *Iron Age*, v. 155, May 31, '45, pp. 38-46.
Study of cracking phenomena in SAE 4130 steel suggests that the origin of cracks is associated with the chemical composition and hardenability, carbide size and distribution, the retention of austenite and subsequent transformation at or about room temperature, the absorption of sufficient hydrogen and the development of internal cooling stresses. Development of a crack-sensitivity test described and temperature-dilation curves analyzed.

22-292. Measuring Efficiency of Training Welders. J. B. Arthur and M. H. MacKusick. *Iron Age*, v. 155, May 31, '45, pp. 48-49, 110.
After establishing standard burn-off rates for various size arc welding electrodes, use of a consumed electrode count (stubs) gives a simple gage of arc time from which a comparative measure of efficiency can be readily calculated for individual students, teacher effectiveness and length of training time vs. tests passed. An increase of 30% in training effectiveness achieved in two months.

22-293. Spot Welding Aluminum with Refrigerated Tips. W. S. Simmie. *Iron Age*, v. 155, May 31, '45, pp. 55-60.
As many as 1600 spot welds were made on duralumin without redressing the refrigerated tip, but when welding DTD 390 Alclad sheet, no improvement is obtained in the amount of electrode pick-up with a refrigerated coolant. With both aluminum alloys, however, the amount of tip wear is reduced by the use of the coolant. (From *Sheet Metal Industries*.)

22-294. Flame Cutting and Machining Methods. Edwin Laird Cady. *Metals and Alloys*, v. 21, May '45, pp. 1313-1317.
Practical considerations, attention to which can improve the effectiveness of flame cutting and flame machining and also notably broaden their utility in any metal-working plant.

22-295. Structural Materials. E. F. Potter. *General Electric Review*, v. 48, June '45, pp. 7-10.
Comparison of the properties of metals used in structures fabricated by welding.

22-296. Reclamation of Magnesium Castings by Helium Arc Welding. B. L. Averbach. *Metal Progress*, v. 47, June '45, pp. 1137-1139.
Salvage of magnesium castings by the helium arc process; experimental work on salvage which helped out when starting to reclaim minor defects.

22-297. Soft Solders. L. G. Earle. *Metal Industry*, v. 66, May 18, '45, pp. 308-311.
"Jointing capacity" may be analyzed into two independent characteristics of the soldering system: Its time-temperature-wetting characteristic and its interfacial-tension characteristic. An apparatus for measuring these two independent characteristics is described. (Institute of Metals.) 2 ref.

22-298. Failures in Steel Fabrication. R. V. Anderson. *Welding Engineer*, v. 30, May '45, pp. 35-37.
Metallurgist can diagnose the cause of failure of a steel structure. Failures leave telltale evidence such as grain structure, deformation, notch-effect nucleus, etc.

22-299. Welded Handling Equipment. Walter J. Brooking. *Welding Engineer*, v. 30, May '45, pp. 38-41.
Transportation of parts and assembled units inside the factory requires as much planning as the actual manufacturing.

22-300. Building Ships Indoors. T. B. Jefferson. *Welding Engineer*, v. 30, May '45, pp. 42-43.
LCM-3s turned out two a week in Armco's unique indoor shipyard, which occupies less than a third of an acre. Jigs and positioners skillfully used.

22-301. Jobs in a Job Shop. R. Brogne. *Welding Engineer*, v. 30, May '45, p. 47.
Everything from repair of cracked engine blocks to the building of a 75-ton hydraulic jack.

22-302. Preparation for Spot Welding. B. F. Dunlap. *Welding Engineer*, v. 30, May '45, pp. 48-49.
Aluminum alloy parts cannot be satisfactorily spot welded without surface cleaning and oxide removal. Best ways of cleaning. Tried and tested procedure.

22-303. Flame-Cutting Guide. R. P. Monroe. *Welding Engineer*, v. 30, May '45, p. 50.
Shape flame-cutting with a portable machine.

22-304. Weldor's Flash—Its Causes and Cure. Joseph S. Wright. *Welding Engineer*, v. 30, May '45, pp. 52, 54.
Presence of large numbers of weldors in shipbuilding and other war industries has created a new industrial hazard—weldor's flash.

(Continued on Page 19)

Employment Service Bureau

Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated. Applicants for the positions listed below are required to observe the rules and regulations of the War Manpower Commission regarding a Statement of Availability, if employed in an essential activity.

Positions Open

YOUNG METALLURGIST: With basic training in chemistry and physics to Ph.D. standard, and some physical metallurgy experience in ferrous field. Excellent post-war opportunities. State age, training, and experience in full with salary required. Box 7-5.

WELDING ENGINEER: To supervise inspection raw materials to finished product in plant manufacturing welding materials. Technical background preferred. Postwar position. Metropolitan New York area. Box 7-10.

METALLURIST: With good basic background of practical and theoretical ferrous and non-ferrous metallurgy. To handle metallurgical control and development work for large manufacturer of powder metal materials. Send age, record, and approximate salary requirements. Box 7-15.

REFRACTORIES MAN: A ceramics engineer, a chemist, or a chemical engineer with experience in the development and treating of refractories and refractory materials. METALLURGIST: An excellent opportunity for a young man to get in on the ground floor of new developments in temperature-resistant alloys to be used in jet propulsion engines and gas turbines. Experience in this field not essential; the requirement is for a young man to train. Should have a good basic education in metallurgy. A recent graduate will be considered. EXPERIENCED ELECTROPLATING CHEMISTS OR CHEMICAL ENGINEERS (2): To handle research on new solutions and processes and new applications of electroplating. CORROSION ENGINEER: To study the causes of industrial corrosion and develop protective measures. WELDING ENGINEERS (2): Capable of handling research on welding methods, machinery and equipment and familiar with the metallurgical problems of welding. Salaries open. Send list of experience and salary desired to Battelle Memorial Institute, Columbus 1, Ohio.

GOOD OPENING for one or two men who have had experience in the industrial heat treating furnace business along the lines of erection, drafting, designing or selling. If you have had experience in any or all of these functions, and if you are looking for a new and permanent connection write us at once. Availability certificate desirable. Location New England. We build oil, gas and electric furnaces, both portable and field erected. Our organization advised of this ad. Box 7-20.

INDUSTRIAL FURNACE SALES ENGINEER: Exclusive territory arrangement on straight commission basis for sales engineer familiar with industrial heat treating processes. Chicago territory now available. Old, well-established company. Address Box 7-25.

SALESMAN: Preferably with experience in the handling of metals or metallurgical products; raw materials rather than fabricated products; age 25 to 40. Salary $3,000 to $4,000. Box 7-30.

METAL CUTTING SAW ENGINEER: To be responsible to the vice-president in charge of manufacturing for the quality, suitability and appearance of all metal cutting saws produced by the company. Degree in metallurgy from an accredited school desired, some experience in metallurgy, preferably in heat treating and small cutting tools plus general machine shop experience. Should be in early thirties. Box 7-35.

METALLURGISTS AND METALLURGICAL ENGINEERS: War industry with exceptional postwar opportunities looking for experienced metallographer. Also research metallurgists for development of non-ferrous metals, special assignments on aluminum, magnesium, and powdered metals. Also metallurgical engineer for development work on steel forgings and tool steels. Write Supervisor, Technical Employment, Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh, Pa.

METALLURGIST: Young, with knowledge of alloy, stainless and carbon steel applications. Required by eastern warehouse distributor. Will involve some contact work. Write stating education, experience, age, draft status, ability and salary expected. Replies strictly confidential. Box 6-5.

SALESMAN: ALLOY AND STAINLESS STEEL: Old established steel concern, Chicago area, has opening for graduate metallurgist with mill or industrial plant experience or equivalent. Excellent opportunity for young man now working in plant but interested in sales. Previous sales experience not necessary. State age, education, experience, salary expected. Box 6-15.

METALLURGIST: For laboratory research department; work is about 75% research and about 25% control. Experience in cast iron field desirable, and ability to take over metallurgical supervision after short training. Midwest location. Box 7-135.

SALESMAN, TOOL STEEL: Cleveland territory. This is a postwar opportunity to become connected with well-known tool steel company. Sales experience not necessary. Must know applications and understand heat treating. State age, salary expected, experience and qualifications. Box 7-140.

ASSISTANT METALLURGIST: To take active part in non-ferrous foundry melting and control research projects of New York City metallurgical company maintaining experimental foundry. Applicant should have at least one year's experience in non-ferrous foundry operation and some training or experience in applied metallography. Please give personal and professional references, stating qualifications and draft status. Box 7-145.

METALLURGIST: Young college graduate for trouble shooting in plant manufacturing diesel engines and steam turbines. San Francisco area. Kindly submit full application details and minimum salary. Box 7-170.

FERROUS METALLURGIST: For cooperative development and sales engineering work. Heavy melting, alloying, casting (open-hearth and electric) and testing experience, with several years of supervisory responsibilities. Must be capable of writing concise reports. Compensation initially on basis of past earning record, later commensurate with performance. Applicant must be free to travel. Include sufficient details including references in first letter. Company headquarters, New York. Box 7-150.

NON-FERROUS PHYSICAL METALLURGIST: For alloy research capable of taking responsible charge of modern metallographic and testing equipment. Extensive experience in physical testing methods (destructive and non-destructive) and particularly in non-ferrous metallography required. Position offers interesting work, adequate compensation, and possibility of growth. Location Metropolition New York. Box 7-155.

NON-FERROUS METALLURGISTS (senior and junior): With practical experience in and literature knowledge of applied physical chemistry of molten metals as related to degasification and deoxididation for current openings in an important project already under way and expected to grow considerably in post-war period. New York City area. Box 7-160.

NON-FERROUS METALLURGIST: For sales engineering work. At least 10 years successful and diversified foundry experience including melting, alloying, sand and permanent mold casting, physical testing, metallography and supervision of production and development work. Should possess personality and character and be free to travel; will be trained in a new and interesting field servicing all non-ferrous melting and casting industry. Give full particulars including previous responsibilities as well as character, professional and business or credit references. Box 7-165.

SALES & FIELD ENGINEER: Manufacturer of Pneumatic Comparator Gages offers an unusual opportunity for a man having basic knowledge of Quality Control and Inspection procedure. Permanent addition to staff for Detroit or New England areas. Write fully—stating education, experience, and salary desired. Replies held confidential. Moore Products Co., H. and Lycoming Sts., Philadelphia 24, Pa.

Positions Wanted

MANUFACTURERS' AGENT SALES METALLURGIST: Established clientele with metallurgists, plant engineers and purchasing agents in Michigan and Northwestern Ohio. Accounts desired in productive or non-productive product used in the automotive industry. Box 7-40.

METALLURGIST: B.S. degree. Four years' general experience includes supervision of heat treating, corrosion control of chemical processes, selection and recommendation of materials, babbitting, analysis of material failures and welding problems, and some research. Interested in responsible position with progressive firm. Will travel or leave States. If you want a conscientious young man with a good personality, write Box 7-45.

CHIEF CHEMIST AND METALLURGIST: For manufacturing company having metallurgical, chemical processing, and finishing problems. Education, B.S. and M.S. in physical chemistry. Seven years' experience, fully capable of supervising complete laboratory control and factory processing of metals. Box 7-50.

METALLURGIST: 15 years' steel mill experience, specializing in physical and chemical testing, heat treatment, metallography, and quality control, in carbon and alloy steels. Considerable experience in investigation of customer complaints, production control, and development work. Age 38. Desires position in supervisory capacity, preferably with small company having definite postwar assurances. Box 7-55.

METALLURGICAL ENGINEER: 10 years' experience in development and production of powder metallurgy products. Wish to contact one or more interested engineers to go into business developing and manufacturing electrical contact materials and other metal powder products. Will consider consulting work along these lines. Box 7-60.

METALLURGICAL ENGINEER: Five years of diversified experience, including 2½ years in aircraft. At present, standards and materials engineer with leading aircraft manufacturer. Familiar with latest heat treating methods and problems confronting design engineers in proper utilization of metals. Excellent background, B.S. and M.S.Met.E. Versatile and imaginative mind. Box 7-65.

LIBRARIAN: Sixteen years in metallurgical and engineering research laboratories. Rare metals, hard carbides, steel. Patent and research records. Now in midwest, prefer far west. Box 7-70.

METALLOGRAPHER: Two years college; three years education through experience in metallurgical laboratory, and process and production metallurgy. Successful research in resistance welding and surface finishes for metals. Working experience in ferrous and non-ferrous heat treating, forging, and foundry melting and centrifugal and sand casting. Honorably discharged Army Air Corps. Release obtainable. Box 7-75.

PHYSICAL METALLURGIST: Midwest location preferred. Young man with experience in non-ferrous and high temperature alloys, and two years' supervisory experience in testing laboratory. B.S. degree from recognized college. Has military discharge. Box 7-80.

HEAT TREAT SUPERINTENDENT OR FOREMAN: Experienced in tool and die hardening, liquid carburizing, cyaniding, nitriding, brazing, bright annealing, induction hardening, flame hardening. Can operate electric and gas-fired furnaces, lead and salt baths, controlled atmosphere furnaces. Two years college metallurgy. Age 41. Box 7-85.

METALLURGICAL ENGINEER: Age 30, wide experience in engineering application, fabrication and heat treatment of carbon, alloy, stainless, electrical and tool steels as well as non-ferrous metals. Experienced in all phases of electrical steel manufacture. Desires position with steel company in technical department leading to sales engineering or sales. Salary $6,500. Box 7-90.

METALLURGIST: Graduate with ten years' steel mill experience in development, research, heat treatment, failure analysis and customer contact work. Desires responsible position with organization having definite postwar possibilities. Responsible and conscientious. Box 7-95.

HEAT TREATMENT SUPERINTENDENT: Fifteen years' experience in heat treatment of both ferrous and non-ferrous metals. Has had supervision of large personnel employed in processing and fabrication of tool steels, alloy steel, high speed, and carburizing work, also aluminum alloys. Available to move anywhere in a week's notice. Box 7-100.

METALLURGICAL ENGINEER: B.S. Metallurgical Engineering, Carnegie Institute of Technology, 1937. Consulting experience in application of metals, engineering design problems, conservation and substitution; two years' experience in metallography, both ferrous and non-ferrous; one year laboratory experience in steel mill, and 1½ years in steel plant. Box 7-105.

METALLURGIST: B.S. in Chem. Engr. and M.S. in Met. Engr., age 32. Nine years of metallurgical supervisory experience in production control, development and research of special non-ferrous casting processes. Patents. Desires connection as chief metallurgist or supervisor capacity with a small progressive company offering good postwar future. Middlewest location preferred. Box 7-110.

Curtiss-Wright Official Foresees More Air Travel Than Statistics Now Indicate

Reported by Frank Kristufek
U. S. Steel Corp. Research Laboratory

An era of unprecedented aircraft travel beginning about 1950 was predicted by Clifford C. Furnas, director of research, Curtiss-Wright Corp., Airplane Division, Buffalo, in a comprehensive talk on "Future Trends in Aviation" at the May 21st meeting of the New Jersey Chapter.

Results of a statistical survey carefully compiled by industrial aircraft statisticians were presented by Dr. Furnas, based upon the plotted curve of the growth of this industry to date. A summary of this rather pessimistic report leads one to expect that the optimum size of immediate postwar commercial aircraft, usually determined primarily by the frequency of service that is offered, will be an airliner of 40 to 50 passengers, which is about twice the size of the present Douglas DC-3. Average flight speed of such aircraft will range from 225 to 300 miles per hour and this report also presents the estimate that in 1950 a total number of 1800 to 2000 planes should fill all our commercial needs.

However, a similar statistical survey in 1910 concerning future production in the automobile industry vastly underestimated the growth of this industry and it is Dr. Furnas's belief that, similarly, present statistical estimates of future aircraft production rates will eventually prove to be several hundred per cent lower than actual production figures.

Four important factors were cited by the speaker, upon which he bases this prediction. They are (*a*) radar navigation and landing devices which will enable commercial aircraft to operate in all types of weather; (*b*) gas turbines, which may render reciprocating engines obsolete, that should result in lower aircraft fuel consumption and maintenance costs with a resultant decrease in travel rates; (*c*) jet propulsion, a potential instrument for making super speeds at high altitudes possible; and (*d*) the helicopter, still in the experimental stage, which offers unlimited possibilities for private flying although its commercial possibilities are limited.

Positions Wanted [Cont.]

MECHANICAL DESIGNER: Graduate mechanical engineer with 13 years' combined technical training. Sixteen years' experience in design, research, drafting room supervision and manufacturing, with past 12 years in engineering department for home appliances and electronics of large electrical appliance manufacturer. Desires position in design research, drafting supervision, or engineering department with firm presently doing war work and a planned postwar future. Age 33, status 2-B, married. Free to move. Box 7-115.

CHIEF METALLURGIST OR EXECUTIVE ENGINEER: Industrial background of 20 years' metallurgical experience in carbon and alloy steel mills, roller bearings, automotive parts and gears, precision aircraft engine parts, electroplating, process control, customer contact and shop problems. Graduate metallurgist, age 41, energetic, resourceful and reliable. Present position chief metallurgist. Desires position with progressive well-established organization receptive to new ideas and with postwar work assured as chief metallurgist, director of metallurgy or executive engineer. Box 7-120.

METALLURGICAL REPRESENTATIVE: For steel or product manufacturer; also qualified for managerial work. University background plus wide experience in ferrous metallurgy as chief metallurgist in war plant specializing in cold forging of heavy sections. Will consider any reasonable offer for United States or foreign location. Box 7-125.

HEAT TREAT SUPERVISOR: Employed as heat treater in a large knitting machine manufacturing plant for nine years; as foreman of heat treating, plating, straightening and sandblasting in an aircraft engineering company; and seven months tool and die heat treat supervisor in forge shop. Draft classification 2-B; free to move. Present employer knows of this ad. Box 7-130.

For Sale

USED LINDBERG Tubulaire Box Type Hydryzing Furnace, Type T-101810-HYT 18 KW; Complete Hydryzing equipment, including HY-2 generator; automatic enclosed magnetic contractor; element transformer; quench tank with removable basket.

USED LINGBERG Tubulaire plain hearth electric Hydryzing furnace, Type T-101810, 10 KW, 1ph. 230-V-Max. temperature 2000° F. with air operated charging door.

NEW CARBO-CLEANER screening machine complete with standard 110-volt, single-phase motor; standard 3/32-in. perforated screen; and waste material drawer. Box 7-1.

For Sale

COMPLETE SET OF ZEISS OBJECTIVES (for bright and dark field and polarized light and for general survey photography), eyepieces and supplementary equipment for a Zeiss metallograph (Zeiss Neophot). Box 7-2.

For Sale

X-RAY UNIT
GE-OX-250 KVA Industrial
Radiographic Unit
Control Stand & Jib Crane
Hardly Used
Immediate Shipment
Box 7-3

Address answers to American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

22. JOINING (*Cont.*)

22-305. **Volts for Vertical Welding.** Charles P. Kelley. *Welding Engineer*, v. 30, May '45, p. 56.
Concise explanation of the various factors involved. Why high open-circuit voltages should be used to do vertical welding.

22-306. **Flash Welding in Metal Fabrication.** H. J. Malee and Gilbert C. Close. *Finish*, v. 2, June '45, pp. 13-16, 50.
Recent developments.

22-307. **Silver Brazed Joints in Severe Service.** R. T. Jones. *Product Engineering*, v. 16, June '45, pp. 412-414.
Considerations in designing joints for silver brazing presented on the basis of experience with military equipment in which severe service conditions such as shock loads, vibrations, and corrosion are successfully resisted.

22-308. **Removing Risers and Padding by Machine Flame Cutting.** R. J. Wolf and J. H. McKlveen. *Foundry*, v. 73, June '45, pp. 92-94, 234-236.
Removing heads and padding on steel castings and a solution presented in the form of oxy-acetylene machine flame cutting

22-309. **New Oxy-Acetylene Methods Speed Mass Production.** J. S. Johnston. *Production Engineering and Management*, v. 15, June '45, pp. 90-94.
Special-purpose machine developed for the pressure welding of liquefied gas cylinders. Application indicates the trend toward use of mechanically controlled equipment for repetitive operations in pressure welding.

22-310. **Back-Pack Oxy-Acetylene Cutting Outfit.** *Steel*, v. 116, June 4, '45, pp. 107, 144.
Developed to speed repair of Navy's battle-damaged ships, may find many postwar industrial applications. Light weight of portable pack permits operator to carry it through narrow passages.

22-311. **Problems in Weld Preparation.** *Industry & Welding*, v. 18, June '45, pp. 34-37, 94-98.
Whatever the application, quality work in welding is essential. Proper preparation and working conditions often are the key to this. Prevention of errors in welding being much less costly than a pound of cure, continuous consideration should be given as to how such common errors in procedure can be overcome and eliminated.

22-312. **Are You Using Carbon Arc Welding?** *Industry & Welding*, v. 18, June '45, pp. 52-56, 59-60.
Carbon arc welding is a highly efficient process for the fabrication and repair of special alloys and nonferrous materials. Requires consideration of arc length, curve values, speed of travel and welding set-up. Standard equipment used and the carbon is connected to the negative pole of the welding machine.

22-313. **Tubular Section Welding.** *Industry & Welding*, v. 18, June '45, pp. 62, 64.
Tubular section welded to end fittings in the aircraft industry. Flash weld is a forged weld, the pieces to be welded rigidly clamped in dies and placed in an electric circuit in such manner that a multitude of fine arcs or flashes occur and heat the surfaces to be joined.

22-314. **Proper Resistance Welding Set-Ups for Ferrous and Non-Ferrous Metals—I.** F. R. Woodward. *Industry & Welding*, v. 18, June '45, pp. 66-75.
Analysis and physical characteristics of a material to be joined by resistance welding will give the correct set-up values for the welding machine. Low carbon steel discussed.

22-315. **Improving the Weldability of High Strength, Low Alloy Steels.** S. L. Hoyt, C. E. Sims, and H. M. Banta. *Iron Age*, v. 155, June 7, '45, pp. 70-76.
Report on the effect of aluminum and titanium upon the crack sensitivity of SAE 4130 steel. Effect of titanium and carbide size on the crack sensitivity properties of NE 8635 steel.

22-316. **All-Welded Composite Steel Beam and Concrete Slab Bridges.** Glenn L. Enke. *Welding Journal*, v. 24, May '45, pp. 435-444.
Shows that an all-welded composite steel beam and concrete slab bridge in the 60-ft. span range will save nearly 19% of the cost of the ordinary type of steel beam and concrete slab bridge, which does not utilize the concrete slab to resist stress, and that an all-riveted design can hardly justify the use of the slab in a composite girder section, as the high cost of providing a riveted shear key between slab and girder absorbs all but 3% of the saving.

22-317. **How to Make Cutting Machine Templets.** Rudolph Chelborg. *Welding Journal*, v. 24, May '45, pp. 444-447.
High degree of accuracy is easily obtained in parts shape-cut by the use of templets. Operator must understand principles of preparing the templets for use. Careful workmanship is important because any inaccuracy in the templet will be imparted through the cutting blowpipe to the shape being cut.

22-318. **Low-Temperature Joining.** R. D. Wasserman and Clinton E. Swift. *Welding Journal*, v. 24, May '45, pp. 449-454.
Low temperature welding supplements soldering, brazing and fusion welding without any of their disadvantages. Advantages of brazing inspired the research work which resulted in the development of the low temperature welding process.

22-319. **Flash Welding 4130 Steel.** W. W. Ackerman and Walter Pestrak. *Welding Journal*, v. 24, May '45, pp. 463-467.
Advantages of the flash-welded joint over the fusion-welded joint are better physical characteristics; lower weights; cheaper and faster production with less operator skill; no warping as a result of welding; less brittleness at low temperatures; higher fatigue strength.

22-320. **Joint Design for Silver Brazing Non-Ferrous Metals.** G. H. Bohn. *Welding Journal*, v. 24, May '45, pp. 467-470.
Joints brazed with the oxy-acetylene blowpipe discussed.

22-321. **Strength of Welded Ships.** R. T. Young. *Welding Journal*, v. 24, May '45, pp. 471-474.
Ship stresses; effect of design on stresses; ship fractures; stress concentrators; quality of steel; location of fractures; some disadvantages of the welded ship.

22-322. **Model Tests of Weld Reinforcements for the Hatch Corners of Welded Ships.** G. L. Smith. *Welding Journal*, v. 24, May '45, pp. 257s—267s.
Tests with model plates to determine the effect of diagonal welded beads or straps applied to deck plating near the corners of hatch openings on ships. Tensile strains can be introduced into the material at the corners of an opening in a plate to prevent a crack from starting at the corner under over-all tensile load or to delay the starting of a crack at a sharp corner until the ultimate strength of the material has been reached.

22-323. **Electronic Flame Cutter.** *Steel*, v. 116, May 28, '45, pp. 102-104, 144.
Radically new system for guiding cutting torches on contour work on steel plate employs plastic records inscribed with full instructions in series of vertical white dashes. "Played back" on machine, and picked up by photoelectric cell actuated by light or projector lamp, records accurately control through drive motors transverse and longitudinal movements of torches.

22-324. **Automatic Arc Welding Air Compressor Tanks.** *Steel*, v. 116, May 28, '45, pp. 116, 118.
Speeds up to 36 in. per min. and 100% penetration with no edge preparation. Carriage-mounted automatic head on beam is rapidly positioned over seam; special fixture, powered by exciter of welding generator, automatically rotates assemblies to be welded.

22-325. **Welding Various Metal Combinations with the Electric Arc.** O. M. White. *Metallurgia*, v. 31, April '45, pp. 299-300.
Weld joining two metals will be of composite make-up, due to the dilution or in-wash of one metal by the other. Physical characteristics of this hybrid weld must be carefully considered in relation to the base metals. The heat effect of welding also affects results. A third metal, deposited as a transition bead, may be used, and its effects must also be considered.

22-326. **Application of Arc Welding to Machine Tool Production.** H. A. *Machinery* (London), v. 66, April 26, '45, pp. 451-454.
Description of methods employed.

22-327. **Alloys for Soft Soldering.** J. C. Chaston. *Metal Treatment*, v. 12, Spring '45, pp. 19-22.
Need for economy in tin has spurred on research into every aspect of solders and soft soldering, and the results are summarized from a number of recent publications. 6 ref.

22-328. **Resistance Welding Equipment Designed for Production.** *Metal Treatment*, v. 12, Spring '45, pp. 64-65.
Electrical control; welding pressure; welding machine as a unit.

22-329. **Observations on the Appearance Welding of Malleable Castings.** H. A. Schwartz, Ira Young, and James Hedberg. American Society for Testing Materials, Preprint 31, 9 pp.
Repair, by welding, of surface defects. Purpose has been to indicate the microstructure which might be expected from various techniques and to investigate those techniques involving a short post heat treatment in comparison with the more established practice of welding with hard iron completely reannealed.

22-330. **Good Welds in Magnesium Made by the Heliarc Process.** F. Masdeo. *American Machinist*, v. 89, June 7, '45, pp. 126-129.
Practical pointers for welding by this method; what results may be anticipated.

22-331. **A Note on the Forge Welding of Silver.** A. G. Dowson. Institute of Metals *Journal*, v. 71, April '45, pp. 205-212.
Laboratory experiments designed to determine the conditions under which satisfactory pressure or forge welds can be made in pure silver sheet described, and the application of the results of these tests to the successful production of a vessel lining difficult to fabricate by other means outlined.

22-332. **Development and Future of Resistance Welding.** H. C. Cogan. *Steel*, v. 116, June 11, '45, pp. 125, 172, 174.
Research has smoothed the course so that procedures now follow known laws. "Off the shelf" equipment affords pressure ranges from as little as 3 oz. to 300,000 lb. Power load problem solved.

22-333. **Improving the Weldability of High Strength, Low Alloy Steels.** S. L. Hoyt, C. E. Sims, and H. M. Banta. *Iron Age*, v. 155, June 14, '45, pp. 74-80, 148.
Crack-sensitivity of SAE 4130 steel is improved with increases in sulphur content because of its secondary effects. Study of post heating indicates that the conditions that give the most favorable results are those corresponding to the conditions in the S-curve which are most favorable to the formation of bainite.

22-334. **Welded Airscrew Hubs.** *Aircraft Production*, v. 7, May '45, pp. 210-215.
Report and survey of the comparatively new flash-butt welding process of producing hubs for the company's well-known airscrews. It shows that considerable material and time economies have been effected by the new technique.

22-335. **Welded Stainless Steel Tubing.** *Heating and Ventilating*, v. 42, June '45, pp. 75-77.
Electric welded stainless steel tubing for pipe lines carrying active chemical solutions. Tubing is made by passing flat-rolled steel through a series of forming rolls which form it into a cylinder and press the edges into contact. Then heavy current flows through the metal, welding the seam and forming a solid wall without the addition of any extraneous metal. The result is tubing with all the inherent advantages of flat-rolled stainless steel plus a weld as strong and corrosion resistant as the rest of the wall.

22-336. **Welding and Brazing Technics in the Electronic Tube Industry.** I. S. Goodman. Electrochemical Society Preprint 29, 14 pp.
Methods of welding and brazing in the electronic tube industry described. Factors which influence the technique discussed: Necessity for vacuum-tight joints; high temperature operation of most electronic tubes; refractory metals which form the structural elements of the tubes; and the extensive use of glass members. Commoner brazing alloys described and tabulated.

22-337. **Applications of Various Resistance Welding Techniques.** F. R. Woodward. *Steel Processing*, v. 31, May '45, pp. 305-309, 316-318.
Product design considerations; seam welding; welding set-up; seam welding machines; seam welding electrodes; intermittent seam; butt seam; machine maintenance; projection welding; types of machines; butt welding; flash welding; materials to be welded; projection, butt, flash welding; wrought iron; low alloy steels; alloy steels; stainless steels; welding of dissimilar materials

22-338. **Soft Solders.** L. G. Earle. *Metal Industry*, v. 66, May 25, '45, pp. 322-325.
Concept of zero M.E.W.T. and gives graphs and values showing the effects of variations in composition and flux on the wetting power of solders for a range of materials.

22-339. **Control of Automatic Welding Processes.** A. E. Bedell and J. B. Quigley. *Canadian Metals and Metallurgical Industries*, v. 8, May '45, pp. 36-39.
Discussion confined to automatic machine welding processes suitable for heavy plate fabrication of mild and certain alloy steels. (Paper for American Welding Society, Oct. 1944.)

22-340. **Use and Evaluation of Some Specialty Adhesives.** Fred Wehmer. *Mechanical Engineering*, v. 67, June '45, pp. 380-382.
Methods of testing bond strength; service-type test for adhesives; specialty uses for adhesives.

22-341. **Welded Bombs for Insects.** *Welding Engineer*, v. 30, June '45, p. 75.
Welding is indispensable to a dispenser for a new insecticide—a "bomb" to kill the pests that spread yellow fever and malaria.

22-342. **Welded Handling Equipment, Part 2.** Walter J. Brooking. *Welding Engineer*, v. 30, June '45, pp. 54-56.
Transportation of parts and assembled units inside the factory requires skillful planning. How welding is used to fabricate a wide variety of steel units for handling materials.

22-343. **Power Systems for Resistance Welding.** J. H. Cooper. *Welding Engineer*, v. 30, June '45, pp. 57-58, 60, 62.
Analysis which will help those who would like to familiarize themselves with the various electrical systems for resistance welders and their applications.

22-344. **All-Welded Invasion Barges.** William A. Springer. *Welding Engineer*, v. 30, June '45, pp. 51-53.
An inland shipyard; carried by cranes; first station assembly; hull now reversed; naval inspection; train own weldors; plant and equipment; other war materiel

22-345. **Welding for the Armed Forces.** R. G. Alison. *Welding Engineer*, v. 30, June '45, pp. 48-50.
Welders in the Canadian army face problems similar to those our own G. I. weldors encounter. First-hand account by a man who spent seven months with the Canadian forces in England, visiting various workshops.

(Continued on Page 20)

22. JOINING

22-346. **Welded Hydraulic Presses.** Clyde B. Clason. *Welding Engineer*, v. 30, June '45, pp. 39-43.
War brought a terrific demand for hydraulic presses. Welding, called in as an auxiliary fabrication method, made it possible to meet critical delivery dates.

22-347. **An Analysis of Hard-Facing.** Fred M. Burt. *Welding Engineer*, v. 30, June '45, pp. 44-47.
Predicts that the use of hard-facing today is as a mere child compared to what it will be when the process is better known and more widely accepted.

22-348. **Mechanized Arc Welding.** *Steel*, v. 116, June 18, '45, pp. 110-112, 154, 156.
Factors to take into consideration: Welding the complicated shape involving locked up stresses in the weld; metallurgical problem of arc welding a 0.30% carbon alloy of self-hardening steel. A heat treating factor and resulting warpage, plus additional warpage from a descaling operation, enter as production problems.

22-349. **The Welding of Non-Ferrous Metals, IV.** E. G. West. *Sheet Metal Industries*, v. 21, May '45, pp. 871-874.
Summary of gas welding processes.

22-350. **Welding Aluminum and Aluminum Alloys.** A. J. T. Eyles. *Sheet Metal Industries*, v. 21, May '45, pp. 875-880.
Type of flame needed; welding rods; fluxes and fluxing; preparation for welding; various types of joint; welding technique; arc welding; preparation of the edges; welding procedure; speed of welding; slag and flux removal.

22-351. **Cutting With Propane.** *Production and Engineering Bulletin*, v. 4, May '45, pp. 164-165.
Use of propane or coal gas advocated as a substitute for acetylene in welding and cutting. Report gives practical guidance as to the scope of propane in flame cutting.

22-352. **Investigation of Bonding in Cylindrical Cast of Bonded Metal Part (Steel-Copper Alloy).** G. Vogt. *Metall Wirtschaft*, v. 22, Dec. 20, '43, pp. 553-556.

22-353. **Deep Penetration Welding.** H. Martin. *Welding*, v. 13, May '45, pp. 140-146.
Technique and applications.

22-354. **Some Considerations in the Design of Class 1 Pressure Vessels.** E. J. Heeley. *Welding*, v. 13, May '45, pp. 147-153.
Characteristics of Class 1 pressure vessels, the requirements of four leading authorities, the strength of welded joints and the suitable design of such joints. (Institution of Mechanical Engineers.)

22-355. **Manual Carbon Arc Welding.** P. L. Pocock. *Welding*, v. 13, May '45, pp. 154-163.
Investigations carried out on different materials and with different joints. Results tabulated.

22-356. **Cast Iron Fusion Welding.** J. K. Johannesen. *Welding*, v. 13, May '45, pp. 167-172.
For maintenance and repair work.

22-357. **Releasable Fuel Tanks.** *Welding*, v. 13, May '45, pp. 173-175.
Production by seam and roller-spot welding.

22-358. **Gas Welding of Mild Steel Plate.** W. Norton Crampton. *Welding*, v. 13, May '45, pp. 176-177.
Penetrational fusion.

22-359. **An Analysis and Comparison of Various Resistance Welding Systems.** R. L. Longini. *Welding Journal*, v. 24. June '45, pp. 535-538.
Compares all aspects of the non-energy storage systems.

22-360. **Resistance Welding Progress.** J. W. Meadowcroft. *Welding Journal*, v. 24, June '45, pp. 538-539.
Review.

22-361. **Application and Development of Modern Heavy-Coated Arc-Welding Electrodes.** D. C. Smith and W. G. Rinehart. *Welding Journal*, v. 24, June '45, pp. 541-548.
Influence of coating materials on the arc energy distribution; welding slag; group I—E6010 and E6011; Group II—E6012 and E6013; Group III—E6020 and E6030; new high-tensile ferritic electrodes. 3 ref.

22-362. **Basic Definitions of Welding Technology.** C. H. Jennings. *Welding Journal*, v. 24, June '45, pp. 549-553.
Forge welding, gas welding, thermit welding, electric arc welding and resistance welding defined.

22-363. **Silver Brazing by Induction Heating.** J. P. "Mike" Weed. *Welding Journal*, v. 24, June '45, pp. 553-556.
Study of the possibilities of the use of silver brazing in aircraft assemblies resulted in the redesign of some assemblies and the procurement of additional equipment for automatically or semi-automatically controlled heating.

22-364. **Spot Welding Machines for Heavy Gages of Ferrous and Non-Ferrous Metals.** Mario Sciaky. *Welding Journal*, v. 24, June '45, pp. 557-563.
Design of resistance-welding machines as affected by the welding of heavy gages of steel and aluminum sheets; welding of scaly steel with conventional machines; variable pressure cycle; three-phase welding machines; principle of operation; method of operation; stored energy welding machines for heavy gages of aluminum; welding machines for heavy gages of steel; spot welds; use of spot welding as compared to arc welding.

22-365. **Welding Railroad Structures.** T. H. Gardner. *Welding Journal*, v. 24, June '45, pp. 563-564.
Use of welding in the strengthening, or reinforcement, of bridge structures provides for the economical replacement of lost metal due to corrosion, or the placing of additional metal to increase the capacity of structures. Proper procedure of the welding may have to be deviated from in order to secure proper fusion and penetration of the parent metals of different characteristics.

22-366. **Efficiency and Production Control of Training Personnel for Manual Arc Welding.** J. B. Arthur and M. H. MacKusick. *Welding Journal*, v. 24, June '45, pp. 565-566.
Training for welding work is a production job. Start with raw material, process, inspect and turn out the product. Method of processing depends upon minimum production requirements for student welders after leaving formal training; money allocated to formal training of operators; operator qualification requirements.

22-367. **The Weld Stress Problem.** *Welding Journal*, v. 24. June '45, p. 313s-319s.
Weldability problem; weld stress problem.

23. INDUSTRIAL USES AND APPLICATIONS

23-123. **Industrial Brushes.** L. E. Browne. *Steel*, v. 116, May 21, '45, pp. 106-108, 142.
Improvements in design and manufacture have resulted in increasing applications for cleaning metals and materials

23-124. **Gear Teeth.** *Automobile Engineer*, v. 35, April '45, p. 151.
Special forms for use with high ratios.

23-125. **Testing Wire Wrapped Steel Pipe.** S. R. Beitler. *Iron Age*, v. 155, May 24, '45, pp. 58-61, 128.
Wire wrapping has been used to strengthen pipe. Tests under OPRD guidance were made to determine whether this practice could be advantageously applied to steel pipe intended for pipeline use. These tests, conducted on 120-ft. lengths of 24-in. diameter steel pipe, included field tests to discover its reactions to handling and pressure tests. Procedures used in winding the wire and the various tests and their results.

23-126. **Electrical Contacts, Part 1.** C. B. Gwyn. *Metals and Alloys*, v. 21, May '45, pp. 1318-1323.
Electrical contacts are among the most important types of special metal parts. Present development—trends and future probabilities in electrical contact materials.

23-127. **Glass as an Industrial Material.** *Metals & Alloys*, v. 21, May '45, pp. 1359, 1361.
Gives type, preparation, composition, sizes, etc., uses of sheet glass, laminated glass, formed glassware, glass fiber materials, and glass structural forms.

23-128. **Al and Mg for Sports Goods.** *Aluminum & Magnesium*, v. 1, May '45, pp. 24-25, 33.
Survey to determine the potential uses to which aluminum and magnesium could be put in sports goods items.

23-129. **Manufacturing the Hercules Piston, I.** J. A. Oates. *Aircraft Production*, v. 7, March '45, pp. 128-139.
Design details; press-forging methods employed by Specialloid, Ltd.; machining sequence; milling the pockets.

23-130. **Platinum Metals.** E. Rhodes. *Metal Industry*, v. 66, May 18, '45, pp. 312-314.
Detailed examples of the uses of the heavy metals in industry, such as contacts, plugs, furnace windings and for pyrometry.

23-131. **The Rare Metals Go to Work and to War, II.** H. A. Bolz. *Modern Machine Shop*, v. 18, June '45, pp. 140, 142, 144, 146, 148, 150, 152.
Platinum metals; vanadium, columbium and tantalum; selenium and tellurium; molybdenum and tungsten; germanium and rhenium.

23-132. **Better Piston Rings From Wartime Experience.** Joseph Geschelin. *Automotive Industries*, v. 92, June 1, '45, pp. 32, 94, 96, 100.
Progressive improvement comes from advancements in metallurgy, surface treatments, surface finish, machine shop practice and quality control.

23-133. **New Packing Resists Corrosion and Heat.** *Iron Age*, v. 155, June 7, '45, p. 68.
Flexible metallic packing capable of withstanding temperatures up to 2000° F. and highly resistant to corrosive gases, alkalies and most acids.

23-134. **Die Castings in the Automobile Industry.** *Die Casting*, v. 3, May '45, pp. 22-24.
Covers the applications of die castings in different industries. The advantages peculiar to the industry are discussed, together with indications of the future trends in design and engineering.

23-135. **Design for a Better Sander.** Peter Zasadny. *Die Casting*, v. 3, May '45, pp. 26-28, 36-40.
Consumer acceptance, performance records, and exceptionally low percentage of service complaints have fully proved the soundness of this die cast design.

23-136. **Procedure for Application of Stainless-Steel Strip Liners to Refinery Vessels in the Field.** K. E. Luger. *Petroleum Refiner*, v. 24, May '45, pp. 99-102.
Detailed description covering satisfactory procedure for attaching strip liners.

23-137. **Ceramic Linings for Acid Tanks.** *Petroleum Refiner*, v. 24, May '45, p. 120.
Tank consists of an outer shell of steel or concrete which is protected on the inside by a lead sheathing or an impervious acid-resisting plastic coating, and an inner lining of acid-proof brick.

23-138. **Aluminum and Magnesium in the Electrical Industries.** B. J. Brajnikoff. *Light Metals*, v. 8, May '45, pp. 205-211.
Deals with the mechanical properties, more especially in the heated state, of aluminum in relationship to its use as a conductor.

23-139. **Aluminum and Magnesium Alloys in Light Engineering.** *Light Metals*, v. 8, May '45, pp. 215-221.
Survey of the use of aluminum and magnesium alloys in the construction of smaller machine tools and allied equipment. In some instances, the applications are of a highly specific nature.

23-140. **Light Alloys in Rectifiers, Photocells and Condensers.** *Light Metals*, v. 8, May '45, pp. 246-254.
Concludes discussion on wet and dry electrolytic condensers and detailed consideration of fixed paper condensers.

23-141. **Manufacture of the All-Steel Refrigerator Cabinet.** C. A. Traphagen. *Steel Processing*, v. 31, May '45, pp. 289-293, 301.
Description of manufacture of the all-steel fabricated product.

23-142. **Corundum—A Vital Wartime Abrasive.** Roland D. Parks. *Mining Technology*, v. 9, May '45, T.P. 1883.
Description of the corundum industry, the administration of wartime control, and certain economic aspects. 7 ref.

23-143. **"Mousetrap" Firing Device.** *Steel*, v. 116, June 11, '45, pp. 126-127.
Made from stampings and assembled in special jigs.

23-144. **High-Head Turbine.** *Steel*, v. 116, June 11, '45, pp. 150, 194.
New turbine is vertical-shaft type designed to supply 39,000 horsepower under head of 1028 ft., highest for its kind in western hemisphere.

23-145. **High Strength Steels Pace Lightweight Development.** F. D. Foote. *Iron Age*, v. 155, June 14, '45, pp. 61-65, 124, 126, 128, 130, 134, 138, 140, 142, 144, 146, 148.
Because of the inherent corrosion resistance of the low alloy high strength steels even greater weight saving can be obtained on mobile structures where corrosion is a controlling factor in determining thickness of plate than strength considerations alone would dictate. Evaluates these steels from their relative technical and economic advantages for the construction of railroad rolling stock, mine and dump cars, trucks and trailers, and barges.

23-146. **The Automobile You Should Get.** *Modern Metals*, v. 1, June '45, pp. 4-7.
Much has been learned about power-driven conveyances during this war. Many of the techniques and designs can be applied advantageously to future conventional automobiles. Resume of ideas.

23-147. **Platinum Metals.** E. Rhodes. *Metal Industry*, v. 66. May 11, '45, pp. 290-292.
Use of platinized asbestos as a catalyst for converting sulphur dioxide to trioxide in the Contact process well known, but further uses of platinum and of the other metals in the group are, perhaps, not so well known. Illustrates some of these uses.

23-148. **These Connection Techniques Solve Aluminum Cable Problems.** Julian Rogoff. *Aviation*, v. 44, June '45, pp. 134-137, 271-272.
Obstacles encountered in effecting dependable, low-resistance hookups with aluminum cable, and how surface treatment of aluminum connectors and proper installation practice can overcome these difficulties.

23-149. **Platinum Metals.** E. Rhodes. *Metal Industry*, v. 66. May 25, '45, pp. 327-329.
Spinnerets for viscose, plating, jewelry, dentistry, and prospects for further commercial applications of this group.

23-150. **Die Castings in the Automotive Industry II.** *Die Casting*, v. 3. June '45, pp. 24-27, 56-57.
Use for decoration.

23-151. **One Good Turn Deserves Another.** L. F. Mead. *Die Casting*, v. 3, June '45. pp. 28-29.
Die cast construction chosen for design of a modern can opening device.

23-152. **The Development of Tin-Free Cans.** H. Kettere. *Metall Wirtschaft*, v. 22, Oct. 20, '43, pp. 493-498.

23-153. **Improved Processes Widen Scope of Ferrous Castings.** G. Vennerholm. *Machine Design*, v. 17, June '45, pp. 135-138.
Discusses improvements of the last few years which will influence the future of the casting for engineering purposes. If certain fundamental principles are followed when designing parts to be cast, some of the difficulties in obtaining sound castings can be eliminated. Greatest change has taken place in the steel foundries.

24. DESIGN

24-40. **A Designer Looks at Light Metals.** George Walker. *Modern Metals*, v. 1, April '45, pp. 10-13.
Designer's conception of some things that can be expected for light metals in tomorrow's planning.

24-41. **Theory of Bending, Torsion and Buckling of Thin-Walled Members of Open Cross Section.** Stephen P. Timoshenko. Franklin Institute *Journal*, v. 239, May '45, pp. 343-361.
Mathematical development of formulae.

24-42. **Steel as a Material.** E. P. Strothman. *SAE Journal*, v. 53, June '45, pp. 314-320, 344.
Reviews the advantages of steel. Gives examples of parts that were not only stronger and more easily fabricated when made of steel but actually a little lighter. It does not follow that steel should replace light metals in every case. It means, rather, that when a part is being designed, all possible materials should be considered, particular consideration being given to the ratio of strength to weight and the modulus of elasticity of each material.

24-43. **Design of Torsion Rod Springs Used in M-18 Tank Destroyer.** *Product Engineering*, v. 16, June '45, pp. 390-392.
Design of a torsion rod spring discussed as to its application, stress range, creep and fatigue life. Points out many steps in manufacture which are critical to obtain a satisfactory design. Methods used in cold working and shot peening described.

24-44. **Torsional Rigidity Calculations for Waffle Type Construction.** John H. Meyer. *Product Engineering*, v. 16, June '45, pp. 393-394.
Comparisons of actual and computed torsional deflections in a specimen door of waffle type, spot-welded construction. Test showed that torsional deformation was about three times that calculated by conventional methods. A procedure for calculating the amount of deformation in waffle panels presented as a basis for empirical design.

24-45. **Practical Research Shows Way to More Economical Bridge Design.** *Railway Age*, v. 118, June 9, '45, pp. 1014-1016, 1021.
Tests on short beam and girder spans by A.A.R. indicate that lower impact values can be used in these structures, with substantial savings in steel.

24-46. **A Method of Measuring Triaxial Residual Stress in Plates.** D. Rosenthal and J. T. Norton. *Welding Journal*, v. 24, May '45, pp. 295s-307s.
Advantage of procedure lies in that by properly selecting the shape and size of the element, the change of stress can be made to follow a known law of relaxation across the thickness. In the case of the welded plates the element is simply a rectangular block. 9 ref.

24-47. **Design Rules—XIII.** Herbert Chase. *Die Casting*, v. 3, May '45, pp. 30, 32-34, 36.
Where good appearance in a die casting is essential, see that its proportions, contours and details are such as to be pleasing to the eye and in keeping with the function that the casting must perform as well as in harmony with other parts of the assembly of which the casting is a part.

24-48. **Designing of "Trouble-Free" Dies XLVIII.** C. W. Hinman. *Modern Industrial Press*, v. 7, May '45, pp. 18, 34.
Welding for the war and peace. Resistance forge welding; "refrigerated" spot welding; assembling and spot-welding bomb fins; one of the "lines behind the lines."

(Continued on Page 22)

NEW PRODUCTS IN REVIEW

PYROMETER PROTECTION TUBES

Michigan Steel Casting Co.,
Foot of St. Aubin Ave., Detroit 7, Mich.

A new type pyrometer protection tube is made from seamless tubing in Misco 35% nickel, 15% chromium alloy and Misco 25% chromium, 12% nickel alloy. A machined tip is welded to the seamless tubing in such a way as to form a uniform wall chamber of the proper alloy. It is the first time these alloys have been available in seamless tubing for pyrometric applications.

These rolled tubes give more than customary protection to thermocouples. Walls are thin, accurate, absolutely uniform, giving quicker response to temperature variations. At the same time they are sounder, denser, more durable than heavier tubes of cast construction or welded units of any type. They are made in several analyses to suit requirements and assure satisfactory results in operating temperatures up to 2200° F.

Mention R120 When Writing or Using Reader Service.

LARGER CAPACITY IN NEW SQUARE FRAME WELDER

The Harnischfeger Corp.,
Welding Division, Milwaukee 14, Wis.

Responding to demands for larger capacity in a square frame welder, P & H engineers have introduced the new Model WA-300, which provides a W.S.R. (Welding Service Range) rating of from 60 to 375 amperes. This large model has two-part construction, single heat control, visual current calibration, and adaptability to parallel operation for higher amperage.

Appearing for the first time in the Model WA-300 are such new features as weather-proof construction, polarity reversing switch, and removable stator, plus overload protection both for contacts and for the new low-voltage magnetic starter.

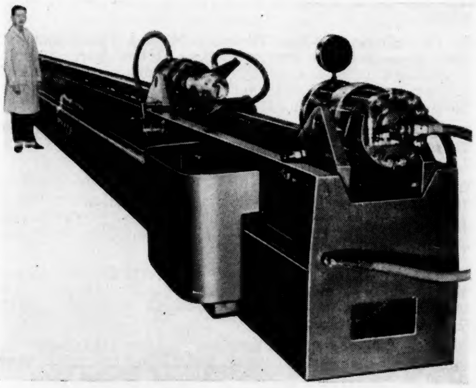
Mention R121 When Writing or Using Reader Service.

HYDRAULIC MACHINE STRAIGHTENS AND STRETCH-FORMS

Hufford Machine Works, Inc.,
207 North Broadway, Redondo Beach, Calif.

This new hydraulic stretch-leveling table has been especially developed for permanently straightening and leveling long narrow metal sections that are twisted, bent or otherwise distorted after rolling or heat treatment. It is particularly useful for straightening rolled and extruded metal used for aircraft fuselage stringers, railroad car structural members, bus body parts, boat frames and similar structural parts that must be straightened prior to forming operations.

This stretch-leveling table is fast, simple and efficient in its operating cycle and the shape, size or length of



the work-piece is no problem. The machine handles sections up to 40 ft. in length of any shape and many materials. It not only straightens the stock by establishing a "set" in the metal through a slight predetermined stretching of the material, but also can be used in conjunction with a die for stretch-forming the work-piece to contours up to 30°. The machine has a pull capacity of 40 tons with a 19-in. stroke on each hydraulic piston, but it can be built in higher or lower capacities to meet the varying requirements of straightening work.

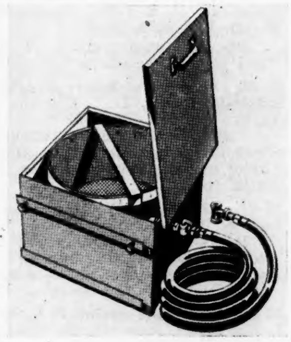
An important feature of the machine is that uniform parts can be produced quickly and accurately whether they are being straightened, or simultaneously straightened and stretch-formed. Complex extruded or rolled shapes are easily handled and accurate control can be maintained over applied tension by means of an automatic stop for definite percentage of stretch so that uniform are strengthened, hardened, and stiffened by the deposited dimensional and physical properties are assured.

Mention R122 When Writing or Using Reader Service.

SMALL PARTS CLEANER AND SOLVENT

Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill.

A new small parts cleaning system, known as the Model P-72, and a new line of cold cleaning solvents called Agitene, are announced by this company. The P-72 is used for removing cutting oils and lubricants used in metal working operations and is ideal for many simple cleaning operations where small parts are to be cleaned in limited quantities.



Several outstanding features of the P-72 are the time-saving Air-gitator, which provides air agitation of the cold solvent, swisher basket and platform, hinged cover, air hose and "T" connection. The size is 15½x15½x11½ in. This unit has mounting bracket, so it can be attached to the side of the Gray-Mills larger model, the P-70 parts cleaning system, or to a wall or work bench.

Agitent (cold) cleaning solvents come in three types. Regular Agitene is for general purpose cleaning in removing cutting oils and other lubricants. Super-Agitene is a fast-acting solvent with a powerful penetrating action that quickly removes grease, tar and sludge. Speed-Agitene is used for hard accumulations, residual gums and grease deposits. It removes paint and sludge without harming metals.

Mention R123 When Writing or Using Reader Service.

PROTECTION AGAINST VIBRATIONS PROLONGS LIFE OF FURNACES

The Korfund Co., Inc., Long Island City, N. Y.

Installation of steel spring vibration control equipment materially increased the useful life of 17 huge furnaces located adjacent to a battery of forging hammers in a drop forging plant.

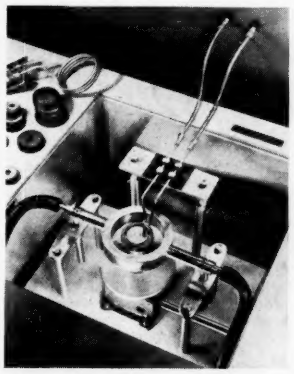
Shock vibrations transmitted from the hammers were causing the arches of the furnaces to collapse after three months of operation. Called on to solve this vibration problem, the Korfund Co. considered it impractical at that time to use the positive vibration control method of mounting the hammers, the source of the vibration, on isolating equipment. Negative control, the isolation of the furnaces receiving the transmitted vibration, was the only alternative. It was decided to experiment with one furnace, mounting it on steel spring isolators. Since the furnaces are from 20 to 30 ft. long, 8 or 10 ft. wide, up to 10 ft. high, and weigh loaded from 150,000 to 200,000 lb., heavy duty isolators were needed.

Mention R124 When Writing or Using Reader Service.

HARDENING GEARS

Lepel High Frequency Laboratories, Inc.,
39 West 60th St., New York 23, N. Y.

High frequency induction heating permits localized hardening confined to the tooth wearing surfaces, retaining the full toughness and ductility of the steel in untreated areas. In the short time required to bring the part to quenching temperature, practically no grain growth or surface decarburization takes place. In order to enable users of the process to secure fullest benefits from its use in hardening such parts, this company has developed a roto-heating and quenching unit for gears and pinions.



The device causes the part to revolve at a predetermined speed within the load coil during the automatically controlled heating and quenching cycles. The result is a degree of uniformity seldom achieved by any hardening process. The entire unit, including motor drive, load coils and quench rings is compact, light in weight and comparatively inexpensive. It can be operated in connection with any standard Lepel induction heating unit.

Mention R125 When Writing or Using Reader Service.

PICKLING AGENT

Waverly Petroleum Products Co.,
Drexel Bldg., Philadelphia 6, Pa.

A new pickling agent to remove rust, scale, tarnish, and incrustations of cement and lime from metals is being marketed as "Troxide." It is non-eruptive and non-inflammable. Troxide throws off no "acid-mist" or other toxic fumes which are pungent, corrosive, and harmful to workmen and machinery. Tests prove that Troxide attacks the scale, not the good metal, and the surfaces are left smooth, clean, and bright; thus, the hazards of over-pickling are materially reduced. It may be used either hot or cold, and lasts many times longer than the conventional acid pickling solutions.

Mention R126 When Writing or Using Reader Service.

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22. DESIGN (Cont.)

24-49. **Metallurgy and Design.** H. L. Lexier. *Canadian Metals and Metallurgical Industries,* v. 8, May '45, pp. 25-29.

Exact knowledge of stresses aids economical construction. Discusses problems which confront the designer. Brief description of several of the new instruments and machines available to the designing and metallurgical engineers which enable them to develop and prove new designs with an accuracy never before possible. Fatigue; internal stress; selection of material; strain gages; brittle lacquers; photo-elasticity; X-ray diffraction. 2 ref.

24-50. **Determination of Location Tolerances.** D. Eastwood. *Machinery* (London), v. 66, May 3, '45, pp. 479-481.

Outlines method of approaching the subject, with special reference to location tolerances of holes in jigs, fixtures, dies and templates.

24-51. **Diamond-Pin Calculation Assures Correct Part Location.** Edward J. Chartier. *American Machinist,* v. 89, June 7, '45, p. 121.

With the equations provided the tool designer can check whether the diamond pin will locate the piece correctly in the fixture.

24-52. **Die Castings in Motion.** *Die Casting,* v. 3, June '45, pp. 30-32, 34-35.

Study of a variety of design applications in cams, levers, flexible coupling, pulleys, gears and sprockets, which are commonly used in machine components; have favorable properties.

24-53. **Stresses in a Cylindrical Shell Due to Nozzle or Pipe Connection.** G. J. Schoessow and L. F. Kooistra. *Journal of Applied Mechanics,* v. 12, June '45, pp. A-107—A-112.

Results reported of a strain-gage test conducted on a 54-in. diameter cylindrical shell to which were attached two 12-in. diameter pipes. The pipes were subjected to direct axial-tension loading, direct axial-compression loading, and transverse bending moments.

24-54. **Improving Design with Tubular Sections.** Roger W. Bolz. *Machine Design,* v. 17, June '45, pp. 111-115.

Tubing—seamless or welded products—provides a range of application and usefulness that covers the entire field of design. Strength and weight characteristics, fine surface finish, close dimensional accuracy, excellent machinability, and heat treatability of commercial and special tubing are other advantageous properties.

24-55. **How to Measure Stresses in Machines.** B. F. Langer. *Machine Design,* v. 17, June '45, pp. 123-127.

Reviews the more important methods now available for the experimental solution of stress problems which cannot be solved by analysis alone. Available methods listed under the headings mechanical, optical, and electrical. 19 ref.

25. MISCELLANEOUS

25-53. **Easy Internal Transport.** *Production and Engineering Bulletin,* v. 4, April '45, pp. 115-120.

Trucks and hand-drawn stackers designed for numerous purposes aid the efficient handling of work, tools and plant.

25-54. **Power Trucks.** E. C. Cook. *Steel,* v. 116, May 21, '45, pp. 112-114, 144, 146, 148, 150.

Contributing more to plant outputs by virtue of their enlarged carrying capacity and greater power. Special designs and attachments also increase their usefulness.

25-55. **Production Drawings Prove Helpful in Assembling Precision Parts.** William Lawrence Lewis. *American Machinist,* v. 89, May 24, '45, pp. 112-115.

Illustrations bear specific data for assembly of small components at each work station. They are particularly useful for novices and assist experienced operators.

25-56. **Engineering Planning—Principles and Methods.** James E. Thompson. *Product Engineering,* v. 16, June '45, pp. 367-371.

Basic functions of coordination, planning, and scheduling discussed; typical examples of record forms.

25-57. **Increasing the Productivity of Research.** Paul E. Klopsteg. *Science,* v. 101, June 8, '45, pp. 569-575.

Need for enhancing and augmenting the results of effort devoted to research and for some ways of measuring the output. Explores means for accomplishing this purpose.

25-58. **Integrated Materials and Methods Control.** Gerald E. Stedman. *Metals and Alloys,* v. 21, May '45, pp. 1302-1308.

Smart engineering in a metal working plant inevitably involves a close tie-in between the selection of materials and the processing methods used for its products. System for controlling and coordinating its materials and methods is responsible for the quality and efficiency of its output and is a worthy model for other metal-working plants to follow.

25-59. **Engineering Shop Notes.** *Metals and Alloys,* v. 21, May '45, pp. 1363-1364, 1366.

Scheduling slide rule. Resistance welded round corners. Diamond hones used on carbide tools. Preparing cast iron for silver brazing. Spot identification of stainless steels.

25-60. **Mechanism for Producing Speed Change by Reversing the Driving Shaft.** K. L. *Machinery* (London), v. 66, April 26, '45, pp. 455-456.

Mechanism is employed on a machine for fabricating a twisted-wire product. Wire is twisted in one direction for a specified number of turns at a given pitch, and then twisted in the reverse direction for a number of turns at a greater pitch.

25-61. **Tolerances for Screw Threads.** J. Butler. *Engineers' Digest* (American Edition), v. 2, May '45, pp. 249-254.

Requirements analysed and tables presented from which allowances may be calculated according to the shrinkage rate of the material to be used, the thread needed, and the degree of fit required. Three schemes of tolerances—fine, medium and coarse—proposed.

25-62. **Paint Materials.** Louis Montgomery. *Industrial Finishing,* v. 21, May '45, pp. 45-46, 48, 50.

Notes on receiving, storing, checking, testing, preparing, and controlling paint materials.

25-63. **Spray Booth Fires.** Peter P. Wood. *Industrial Finishing,* v. 21, May '45, pp. 80, 82, 84.

Causes of spray booth fires, where to position and how to fix the sprinkler heads, what causes spontaneous combustion fires, what to do to keep spray booths safe.

25-64. **The Organization of Metallurgical Research.** Richard Seligman. Institute of Metals *Journal,* v. 71, April '45, pp. 149-164.

Appeal for the formation of an all-embracing Metallurgical Council.

25-65. **Collection and Control of Magnesium Dust and Fumes, II.** O. E. Fenn. *Industrial Heating,* v. 12, June '45, pp. 1007-1008, 1010.

Discusses requirements of dust-collecting systems, and safety precautions and disposal of collected dust.

25-66. **Economical Power Distribution for Medium-Size Industrial Plants.** D. L. Beeman. *Steel,* v. 116, June 18, '45, pp. 116, 118, 160, 162.

Installations formerly believed to deliver most economical power for motors, controls, and other apparatus by using 2400 volts have increased efficiency with 4160 volts.

25-67. **Simplified Working Drawings.** *Production and Engineering Bulletin,* v. 4, May '45, pp. 183-186.

Breaking down production into simple operations carried a step further by supplying each operator with an elementary drawing showing clearly only information relating to the operation he performs.

25-68. **Force and Shrink Fits.** William Knight. *Machine Design,* v. 17, June '45, pp. 145-148.

Strength; commercial fits and tolerances; centrifugal forces.

26. STATISTICS

26-93. **Prospects for Principal Cast Metals, Part 2.** Donald J. Reese. *Tool & Die Journal,* v. 11, May '45, pp. 107-109.

1943 and 1944 production for cast steel, gray iron, malleable iron, aluminum and magnesium.

26-94. **West Girds for Steel Fight.** *Western Metals,* v. 3, May '45, pp. 8-11.

Retention and development of iron and steel production in the West.

26-95. **Prospective Markets for Steel in New Western Fabricating Industries.** J. R. Mahoney. *Western Metals,* v. 3, May '45, pp. 18, 21-22.

Relation of new western steel mills to new industries; amount of steel used in products made.

26-96. **Zinc in the Pacific Northwest.** Fred Draper. *Mining World,* v. 7, May '45, pp. 20-23.

Tri-state output declining; importance of western ores; N. W. reduction capacity needed; retort vs. electrolysis; uses of "four-nines" metal; zinc plant by-products; postwar zinc prices.

26-97. **Materials Supply Outlook for Product Finishes.** Ed. H. Bucy. *Products Finishing,* v. 9, June '45, pp. 58-59, 62, 64, 66, 68.

The immediate situation; demands of the Pacific War; the materials situation analyzed; surplus stocks available; the postwar picture.

26-98. **Metals and Minerals in Post War Economy.** John D. Sullivan. *Mines Magazine,* v. 35, April '45, pp. 162-165, 181.

Effect of scrap in the postwar period on some of the more important metals. Comments briefly on aluminum and magnesium and on the world outlook on the supply of crude petroleum.

26-99. **Zinc-Reduced War Demands and Tariff Issue Obscure Outlook.** H. H. Wanders. *Engineering and Mining Journal,* v. 146, June '45, pp. 82-83.

That the domestic zinc producer gets excited when the subject of import duties is under discussion is understandable when the rates are examined and digested. The table was prepared by the American Zinc Institute and presented at the hearings on the bill for extending the Reciprocal Trade Agreements Act.

26-100. **War Production Board Reports on Steel Expansion for War.** *Steel,* v. 116, June 18, '45, pp. 98-106.

Details how ore, transportation, ferro-alloy, refractory, blast furnace, steelmaking, foundry, forging and other facilities were built up to supply huge requirements for war; steel industry faces no real conversion problem in transition from war to peace; data will be used in pending congressional hearings.

26-101. **The Post-War Outlook for the Base Metals.** Alan M. Bateman. *Western Miner,* v. 18, June '45, pp. 84, 86, 88, 90, 92.

It is now more difficult to foresee what may eventuate than after former crises, since this war has been so revolutionary with respect to the quantities involved and in the profound economic changes that have taken place in both producing and consuming countries. World flow of minerals cannot slip back into the old pre-war groove.

27. NEW BOOKS

27-79. **Books, Publications and Patents of Battelle Memorial Institute, 1929-1944.** 72 pp., Battelle Memorial Institute, Columbus 1, Ohio. Free upon request.

Catalog listing more than 800 journal contributions, books and patents in the fields of chemistry, welding, applied mechanics, mineral dressing, industrial physics, ceramics, fuels and metallurgy.

27-80. **The Chemical Formulary.** Harry Bennett v. 7. 506 pp., Chemical Publishing Co., Brooklyn, N. Y. $6.00.

A collection of valuable, timely, practical commercial formulae and recipes for making thousands of products in many fields of industry. New formulae have been added and the directory of sources of chemicals and supplies has been enlarged. Chapter XII on metals and alloys covers the field in a long index of formulae ranging from aluminum plating to zinc coatings.

27-81. **Principles of Firearms.** Charles E. Balleisen. 154 pp., bibls., illus., diagrs., John Wiley & Sons, Inc., 440 Fourth Ave., New York. $2.50.

The operation of familiar weapons, analyzed from the viewpoint of a mechanical engineer. The author is in the U. S. Army Ordnance Department.

27-82. **Practical and Theoretical Photography** (2nd Edition). Julian MacFarlane Blair. 251 pp., illus., diagrs. Pitman Publishing Co., New York. $2.50.

The material has been brought up to date and a chapter on aerial photography and surveying and many new illustrations have been added. Practical aspects of X-ray, photomicrography and lantern slides are included.

27-83. **History of Photography.** Josef Maria Eder. Translated from the German by Edward Epstean. 880 pp., bibl., Columbia University Press, N. Y. $10.00.

A comprehensive examination of photography from Aristotelian light theories through the modern ramifications of photochrome.

27-84. **Engineering Preview, an Introduction to Engineering Including the Necessary Review of Science and Mathematics.** L. E. Grinter and others. 619 pp., illus., Macmillan Publishing Co., New York, N. Y. $4.50.

The primary purpose of this volume is to acquaint the prospective engineering student with those sciences essential to a study of engineering and to assist him in deciding whether he is suited for this profession.

27-85. **Plastics in Practice; A Handbook of Product Applications.** John Sasso and Michael A. Brown, Jr. 195 pp., bibl., illus., diagrs. McGraw-Hill Publishing Co., 330 W. 42nd St., New York, N. Y. $4.00.

Properties of various plastics and fabricating methods, as they have proved themselves in commercial uses. For the designer or engineer who is not an expert in plastics.

27-86. **Electrical Coils and Conductors; Their Electrical Characteristics and Theory.** Herbert Bristol Dwight. 360 pp., bibl. diagrs. McGraw-Hill Publishing Co., 330 W. 42nd St., New York, N. Y. $5.00.

An advanced textbook with many numerical problems based on practical cases. A knowledge of practical operating principles of electrical coils and conductors is essential to the use of this volume.

27-87. **Hilfsbuch fur die praktische Werkstoffabnahme in der Metallindustrie; 2nd Edition.** Ernst Damerow and A. Herr. 117 pp., illus. J. W. Edwards Brothers, Ann Arbor, Mich. $3.75.

27-88. **Die chemische Emissions—Spektral—Analyse; pt. 3, Tabellen zur qualitativen Analyse; 2nd Edition.** Walther Gerlach and E. Riedl. 163 pp. J. W. Edwards Brothers, Ann Arbor, Mich. $3.25.

27-89. **Elektrometrische pH—Messung mit kleinen Losungsmengen.** Franz Fuhrmann. 139 pp., bibl., illus., J. W. Edwards Brothers, Ann Arbor, Mich. $3.00.

27-90. **Die Lösungsmittel und Weichhaltungsmittel; 4th Edition.** Hellmut Gnamm. 516 pp., bibl., illus., (Monographien aus dem Gebiete der Fettchemie, v. 1). J. W. Edwards Brothers, Ann Arbor, Mich.

27-91. **Technik der tiefen Temperaturen.** Johannus Antonius van Lammeren. 264 pp., bibl., illus. J. W. Edwards Brothers, Ann Arbor, Mich. $6.00.

27-92. **Radioaktivitat; v. 1, Grundlagen und Messmethoden.** Hans Israel. 155 pp., bibl., illus. (Geophysik—Meteorologie—Astronomie, v. 2). J. W. Edwards Brothers, Ann Arbor, Mich. $3.50.

27-93. **Die Gewinnung von Felten und fetten Olen.** Reinhard Lude. 224 pp., bibl., illus. (Technische Fortschrittsberichte, v. 47). J. W. Edwards Brothers, Ann Arbor, Mich. $5.25.

27-94. **Die elektrometrische (Potentiometrische) Massanalyse; 6th Edition.** Max Erich Müller. 315 pp., bibl., illus. J. W. Edwards Brothers, Ann Arbor, Mich. $5.50.

27-95. **Ausgewahlte chemische Untersuchungsmethoden fur die Stahl und Eisenindustrie; 3rd Edition.** Otto Niezoldi. 192 pp. J. W. Edwards Brothers, Ann Arbor, Mich. $2.80.

27-96. **Elektrolytische Wanderung in flussigen und festen Metallen.** Karl Ernst Schwarz. 102 pp., bibl., illus., J. W. Edwards Brothers, Ann Arbor, Mich. $3.50.

27-97. **Chemie und Technologie der kunstlichen Harze.** Johannes Scheiber. 847 pp., bibl., illus. J. W. Edwards, Ann Arbor, Mich. $18.50.

27-98. **Mikrophotographie.** Gerhard Stade and H.Staude. 210 pp., bibl., illus., J. W. Edwards, Ann Arbor, Mich. $5.00.

27-99. **Steam and Gas Turbines, With a Supplement on the Prospects of the Thermal Prime Mover.** Aurel Stodola. Translated from the sixth German edition by Louis C. Loewenstein. v. 1, 763 pp.; v. 2, 591 pp. Peter Smith, New York, N. Y. $20.00.

27-100. **Chronology of the Tinplate Works of Great Britain.** Edward Henry Brooke. Morgan & Higgs, Ltd., Union Street, Swansea, England. 8s.

27-101. **Mining Machinery; an Elementary Treatise on the Generation, Transmission and Utilization of Power for Candidates for the Under-Managers Certificate.** T. Bryson. 2nd Edition. 388 pp. Pitman Publishing Co., London, England, 17s. 6d.

27-102. **Welding and Brazing Alcoa Aluminum.** Aluminum Co. of America. Revised Edition. 110 pp. The Aluminum Co. of America, 2140 Gulf Bldg., Pittsburgh, Pa. Free upon request.

27-103. **Making Patent Drawings.** Harry Radzinsky. 103 pp., illus., diagrs. Macmillan Publishing Co., New York. $3.00.

The style prescribed by the United States Patent Office is followed in this guide for draftsmen. Most of the drawings are by the author and Julius H. Lutz.

27-104. **Quality Through Statistics.** A. S. Wharton. 69 pp., Philips Lamps, Ltd., London, England. 6s.

27-105. **Engineering Data.** Cincinnati Milling Machine Co. Oakley, Cincinnati, Ohio. 60 pp. Free upon request.

27-106. **Job Safety Training Manual.** Kenneth L. Faist and Stanton M. Newkirk. 70 pp., National Foreman's Institute, Deep River, Conn. $5.00.

27-107. **Flammable Liquids, Gases, Chemicals, and Explosives.** 560 pp., illus., National Fire Protection Association, Boston, Mass. $3.00.

27-108. **SAE Handbook. 1945 Edition.** 620 pp., Society of Automotive Engineers, 29 West 39th St., New York 18, N. Y. $5.00.

All SAE official current standards, including iron and steel, non-ferrous metals, and parts and fittings, plus general data. Revised standards include methods of determining steel hardenability, steel hardness conversion numbers, automotive gray iron castings, and NE steels.

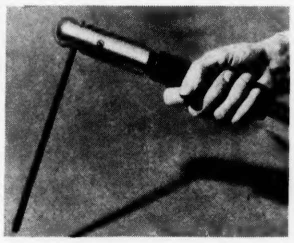
NEW PRODUCTS IN REVIEW

ARMOR-CLAD, INSULATED ELECTRODE HOLDER

General Electric Co., Electric Welding Division, Schenectady, N. Y.

This new armor-clad (screw type), fully insulated electrode holder is recommended for use wherever durability, maximum safety, and minimum operator fatigue is desired.

Feature of the new holder is its head, which is completely enclosed in a sheath of aluminum armor. This armor protects the insulation, resists weld spatter, and eliminates the possibility of accidental contact with the welding circuit. Thus the holder remains clean while in use and lasts considerably longer than insulated holders without armor.



Designed to accommodate electrodes up to and including ¼ in. in diameter, the holder is easy to use, light in weight (15 oz.), and unusually cool in operation. A slight twist of the hand tightens or releases the electrode. While in use, the holder firmly grips the electrode at the proper angle and good current contact is maintained. This keeps the holder cool, tends to prevent overheating of the electrode, and maintains a uniform melting rate clear down to the stub end. The width of the electrode slot limits the size of the electrode which can be inserted, thus preventing overloading.

Mention R127 When Writing or Using Reader Service.

ELECTRODE WELDS COPPER ALLOYS WITH A.C. AND D.C. CURRENT

Eutectic Welding Alloys Co.,
40 Worth St., New York 13, N. Y.

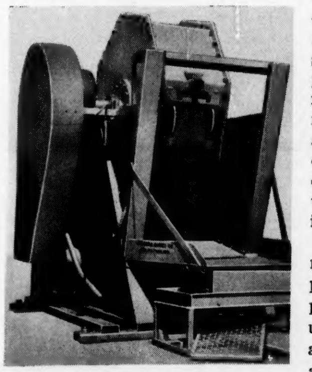
This new electrode for arc welding, known as EutecTrode 28, is a coated special bronze alloy to be used for the arc welding of bronze, brass, and copper. It contains an unusual combination of metals and is shielded with a newly devised flux coating that makes it suitable for use either on a.c. or d.c. current. EutecTrode 28 will deposit dense and tough metal that is a good color match to most types of bronzes. It will give the welded area substantially the same corrosion resistance as these various base metals possess. It may also be used for welding copper and brass or joining these metals to steel, cast iron, or nickel alloys, and for overlaying steel or cast iron to provide a good bearing surface. It is available in ⅛ and 3/16 in. diameters and can be identified by a light green tip. A procedure sheet on the proper use and application of EutecTrode 28, and a photograph of a welding job done with it are available.

Mention R128 When Writing or Using Reader Service.

DEBURRING PROCESS

De Burr Barrel Co., Inc.,
4579 Hollywood Blvd., Los Angeles 27, Calif.

This De Burrette deburring process is said to be as smooth as honing. Both soft metal and hardened steel parts are deburred with a smooth over-all finish in quantity lots. Tolerances of 0.001 in., which must be held for grinding and lapping, are not affected. Burrs are not ball-peened and are not marred, because De Burrettes cushion the load as they grind and polish.



De Burrettes are made from soft Neoprene rubber impregnated with the universally accepted aluminum oxide abrasive. As each particle of the abrasive is rubber-mounted, the cutting action is cushioned and the softest metals are not scratched; but the constant, even sliding pressure of the De Burrettes on the metal provides fast cutting action.

As an example of operating costs, 250 hardened steel hydraulic unit camshafts were deburred in 3 hr. at a total cost of 45c for the De Burrettes and power. Depreciation of De Burrettes averages about ½% in 24 hr. De Burrettes are used dry, and no rust therefore results.

The De Burrette barrel itself is lined throughout with abrasive resistant Neopreme rubber approximately ¼ in. thick. The large diameter, narrow octagon-shaped barrel provides the most efficient finishing action for the De Burrettes while a variable speed transmission permits adjustment for a wide range of loads of varying character and weight.

Mention R129 When Writing or Using Reader Service.

ELASTIC SLEEVE SEAL

Temperature Control Devices, New Haven 15, Conn.

The elastic sleeve seal is a new development for centrifugal, rotary, reciprocating, and any other pumps using rotating shafts that must be sealed.

A critical point in reciprocal and rotary compressors is the sealing of rotary shafts. In the early days the Bellows Seal took its place as the leader for new compressors; however, the problem of replacing a worn seal proved to be a costly one since it was necessary to remove the crankshaft from the compressor and perform a rotary grinding job in order to prepare it properly for a new seal.

The elastic sleeve, to be known as "The Seal of Approval," is at present being manufactured for use with new compressors and as a replacement seal for old. It has been shown to work equally well on bent, pitted, or slotted shafts and eliminates all springs, shims, and shaft glands due to the perfected development of a new, oil resistant elastic material which is being used as the body of the elastic sleeve.

The seal bearing is located at the source of oil supply thereby assuring longer life due to proper lubrication. The new, simplified design which has been worked out for all modern installations permits faster installation.

ELECTRIC BOX TYPE FURNACE

Mahr Mfg. Co., Division of Diamond Iron Works, Inc., Minneapolis 11, Minn.

This electric furnace is designed for hardening carbon and alloy steels below 2000° F.; for tempering or drawing heat treated parts; for annealing and normalizing; pre-heating high speed steels; and for experimental and development work.

Ruggedly constructed, the shell is made of steel plate reinforced with structural sections and supported by legs formed integral with the case. Careful selection of insulating materials results in very low heat conductivity through the walls. The door is of fabricated plate lined with castable refractory and high temperature insulation. When closed, the door wedges tightly on all sides to prevent heat losses and does not require a sand seal. Hearth plate is cast nickel-chromium alloy with upturned flanges on sides and back.

Mention R131 When Writing or Using Reader Service.

CONTINUOUS CAST BRONZE

Ampco Metal, Inc.,
1745 S. 38th St., Milwaukee 4, Wis.

Certain bronze alloys previously available only as sand, permanent mold, or centrifugal castings are now produced by a continuous casting process in mill length rods of superior quality. As such they are adapted to fabrication on automatic screw machines and present an opportunity for improved production and large economies.

The structure of these continuous cast rods is extremely uniform—the lead content or other secondary constituents being uniformly dispersed in a finely divided state throughout the entire section. The density of the material produced is for practical purposes equal to the theoretical density.

Continuous cast bronzes, as applied to forms to be machined or used "as cast," is exclusive with this company. As the name of the process implies, the rod is produced by the continuous withdrawal of metal from the bottom of a casting crucible. The metal is solidified as it leaves the crucible and passes through a suitably cooled die of closely held dimensions. It is guided by driving rolls to a travelling cut-off device which engages at proper intervals to yield sound rods of good surface, uniform diameter and even length. Dirt and drosses, being light, do not enter the solidifying rod—gases, always present are eliminated upwards—and the molten bath presents a steady hydrostatic head to prevent the formation of shrinkage cavities.

Mention R132 When Writing or Using Reader Service.

LABORATORY AND PILOT PLANT OVEN

Industrial Oven Engineering Co.,
11621 Detroit Ave., Cleveland 2, Ohio.

Streamlined, compact and completely self-contained oven for laboratory and pilot plant use is now available with sizes of oven working space ranging from 3x3x3 ft. to 6x6x6 ft., in increments of 1 ft. Special sizes are furnished to specification.

Temperatures range up to 900° F., with a guaranteed differential of ±2°. This type of oven is usually furnished with electrical heating equipment, but is designed to use any type of fuel. In every case, the heating equipment is contained within the oven shell. The smaller models are shipped assembled, ready to connect to the heat source. The oven is designed particularly for precision experimental work in drying, baking, aging and heat treating.

It can be furnished with special construction to withstand corrosive fumes, and can be furnished with exterior baked enamel finishes in a variety of colors to harmonize with surroundings. Automatic temperature controls are provided to suit the processes for which the oven is to be used.

Mention R133 When Writing or Using Reader Service.

NEW PLUG GAGE

Standard Gage Co., Inc., Poughkeepsie, N. Y.

The DuBo gage is a new plug gage which, it is claimed, is in many respects the most satisfactory bore checking gage of the fixed limit type yet produced. Users assert that the DuBo is not only very simple and easy to use, but that it also reveals more about the internal conditions of a bore than any other form of plug gage.

The DuBo gage is unique in appearance. The small sizes, from 0.240 to 1.510 in. diameter, have the go and not go gaging members attached to the opposite ends of a light weight metal handle. The larger sizes, from 1.510 to 6.010 in. diameter, are single-end gages, individually mounted on palm-fitting plastic handles.

Both types utilize a new effective color identification system that eliminates fumbling, wasted motion and the risk of errors in choosing the proper gage. Go members of both the double and single-end DuBo gages are marked with a broad band of vivid green enamel under a durable, transparent plastic ring. Not go members are similarly identified by brilliant red bands. The handles of the double-end gages also carry corresponding dots of color.

The DuBo gage head is a relatively thin disk which is a section of a sphere. The spherical gaging surface makes contact with the bore walls only at the instant and point of bore gaging. Two chamfered sections, diametrically opposed on each member, make it possible, by slightly tilting the handle, to enter the gage into bores easily, without force or fumbling or running the risk of marring even highly polished work pieces. A gage without chamfer can be inserted in a bore only a comparatively short way. The DuBo, on the contrary, can be used to check deep bores, as the handle need be tilted only slightly when applying the gage and does not touch the bore walls. The design of the DuBo gaging members also permits accurate gaging almost to the bottom of blind bores. The chamfered section makes possible easy inspection in tending to wipe away foreign material from the gaging area and thus helps to prepare a clean surface for accurate gaging.

In use, only a small portion of the gaging surface makes contact with the surface of the bore walls. This materially reduces wear on the gage and also focuses the gaging contact to a very small area. As the DuBo gage may be introduced into bores smaller than its diameter, it provides a means for checking out-of-roundness and taper, even when these conditions are on the minimum side of the tolerance or smaller than the go dimension. It is consequently possible to check a back taper in a part which the ordinary fixed limit gage could not enter and to discover faults which conventional plug gages might bridge.

Mention R134 When Writing or Using Reader Service.

NEW POWDER METAL PRESS

F. J. Stokes Machine Co.,
Philadelphia 20, Pa.

This new G-2 press is designed for high speed production, up to 45 strokes per min. in automatic operation on the usual run of work, and to operate also as a start-stop press in making parts with inserts. This machine is of 12 tons capacity and of design similar to that of the G model which has been in wide use for many years.

This press is recommended for making small machine parts such as gears, internally or externally splined bushings and ordnance components, carbide tool bits and drawing dies, carbon brushes, brushes with pig-tails and iron cores with threaded shafts molded in place and many other similar parts.

As a start-stop press the operator simply places the insert in position and pushes a button; the press measures the charge in the usual manner, compresses the material around the insert, ejects the finished pieces, leaving the punch in the "up" position for the next cycle. Operation is very rapid and skilled help is not necessary.

The machine is cam operated, with independent cam control of both upper and lower punch movements. The die table is braced to take the full rated tonnage of the machine, and pressures applied through the punches may be simultaneous or non-simultaneous. An independent secondary lower punch applies pressure up to 2½ tons and may be used as a fixed core rod. The upper punch will stay out of the way during nearly a third of the cycle, to facilitate feeding, and is timed to first descend rapidly and then slowly compress the material with controlled motion.

Powered by a 5 hp. variable speed drive, this machine has a capacity up to 45 pieces a min., depending upon the material and the nature of the part being formed. Maximum die fill is 4 in. Maximum size piece is 1½ in. diameter or equivalent area.

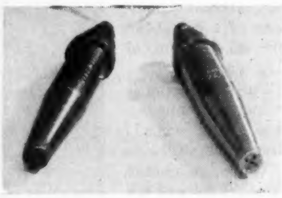
Mention R135 When Writing or Using Reader Service.

NEW PRODUCTS

CHEMICAL METHOD RECLAIMS BURNER TIPS AND FITTINGS

Turco Products, Inc.,
6135 South Central Ave., Los Angeles, Calif.

This is a simple chemical method for reclaiming burner tips and welding torch fittings without manual labor. These fittings choke up with tenacious carbon, causing dimensional changes which reduce the efficiency of the equipment. Manual methods of cleaning consume large amounts of time, and rarely is the equipment restored to its original state of efficiency. For lack of an effective method of cleaning, burner tips and fittings have frequently been discarded. To solve this problem, a simple, two-stage chemical process was developed, which makes possible the salvaging of hundreds of these parts.



Burner tips and fittings are first soaked in Turco L-780, a liquid material with solvent and penetrating actions, which digest carbon and gum deposits, softening and loosening them so that they are freely rinsed away. The material is non-corrosive to copper and brass. Non-inflammable, Turco L-780 mixes readily with water, thereby avoiding the use of costly, inflammable solvents in the rinse. The compound is used at room temperature, in an ordinary steel tank or container, such as is readily available at most plants. An overnight soak is sufficient to loosen and soften all carbon and dirt. At the completion of the soaking period, the parts are rinsed clean in a vigorous air and water spray.

After the Turco L-780 treatment, the parts will be physically clean, but will be more or less heavily oxidized and tarnished because of the high heat to which this equipment is exposed. A brief dip in Turco Brass Dip, a safe detarnishing liquid, completely removes this film, leaving the metal completely clean and bright. Turco Brass Dip is used in a ceramic crock or container. Long-lived and active, a small amount of the material will clean several hundred burner tips and fittings. Turco Brass Dip not only brightens the metal, but passivates the surface, thereby rendering it resistant to corrosion between cleaning periods.

Literature describing the process in detail is available without cost.

Mention R136 When Writing or Using Reader Service.

LABORATORY GAS ATMOSPHERE PRODUCER

Associated Industrial Engineers, Inc.
1505 Race St., Philadelphia 2, Pa.

To meet demands for a small universal gas cracker and generator capable of producing any desired analysis of atmosphere gas, this company has developed and built a single unit capable of fulfilling this requirement and which, in addition, is variable in output from 10 to 50 cu. ft. per hr.

The generator satisfies a long-felt want in most manufacturing plants conducting research on metals and experimental heat treating as well as in production plants turning out small quantities of special alloy parts or powder metal parts. The generator is universal in that it can be used as an exothermic gas generator, and endothermic gas cracker, or if desired, as an ammonia dissociator.

The one unit is complete with gas mixing machine, catalyst furnace, retort, gas cooling condenser, control valves, and automatic temperature controls and is shipped ready for operation. Using natural gas (methane), the following typical analyses are produced depending upon the reaction used: Endothermic reaction—18% CO, 34% H_2, 46% N_2, 1% CO_2 (lean ratio); 19% CO, 40% H_2, 40% N_2, 0% CO_2 (rich ratio); exothermic reaction—0.5% CO, 0.5% H_2, 89% N_2, 10% CO_2 (lean mixture); 10% CO, 15% H_2, 70% N_2, 4 CO_2 (rich mixture). Using anhydrous ammonia the following analysis is produced: 75% H_2, 25% N_2 (residual Ammonia 0.05%).

Larger units are also made in sizes up to and including 1000 cu. ft. per hr. output.

Mention R137 When Writing or Using Reader Service.

RUST INHIBITOR

Mitchell-Bradford Laboratories, Bridgeport, Conn.

"Witch Oil," a new rust inhibiting oil, protects metal stampings after pressing and while in storage or transit and acts as a bond for paint or enamel. It is in use on automobile filters. Shells are degreased after pressing then dipped in Witch Oil and shipped to point of assembly where complete units is enameled without further preparation.

Witch Oil withstands the baking heat up to 250° F. and continues to maintain a film on the interior of the shell making unnecessary the application of oil for protection between manufacture and use. This oil may be used for all types of steel stampings, forgings and castings in the same way.

Mention R138 When Writing or Using Reader Service.

MANUFACTURERS' CATALOGS

Airless Wheelabrator

American Foundry Equipment Co.,
555 S. Byrkit St., Mishawaka, Ind.

A new, 24-page informative catalog answers concisely every question about the Wheelabrator—the simple mechanical unit that utilizes controlled centrifugal force, instead of compressed air, for abrasive blasting.

This booklet is the first inclusive, concise presentation of all phases of airless blast cleaning in the metal working field; consequently, it is of value to all plants in which blast cleaning is an important part of their production.

The Wheelabrator principle and mechanism which has so revolutionized blast cleaning is presented in this profusely illustrated catalog, with interesting facts, diagrams and tables. Complete sizes of the three types of blast cleaning machines on which the Wheelabrator is offered—Tumblast, tables and special cabinets—are illustrated and described.

A partial list of the multitude of products being Wheelabrated, and a few of the over 2000 Wheelabrator users are included to illustrate the versatility and acceptance of the Wheelabrator in industry.

The range of Wheelabrated metal finishes which is possible with the use of the various sizes of steel shot and grit abrasive is shown in a series of magnified illustrations with suitable descriptions.

Mention R139 When Writing or Using Reader Service.

Bronze Bearing Metal

Sorel Steel Foundries Limited,
1405 Peel St., Montreal, Canada

This company offers Sumet bronze bearing metal to the steel, mining and other industries; details of this product, for which Sorel has held sole rights of manufacture and sale in Canada and the British Empire for the past eight years, are given in an attractive bronze-covered booklet now being distributed. The company holds a license from the R.C.A.F. to sell Sumet to aircraft manufacturers for fuselage controls.

Sumet is a high lead bronze which, although not sold as an oilless bearing, will in the event of lubrication becoming faulty or ceasing entirely, operate almost indefinitely without scoring or seizing the shaft. It is manufactured from a processed lead which is minutely distributed through the virgin copper and tin matrix and, as heat is set up by friction, the particles of lead sweat out and lubricate the shaft, and this without exhaustion of its lubricating quality.

Sumet has many industrial applications, listed in the booklet with thorough explanations and fine illustrative material. The steel and mining industry will be particularly interested in its proved value for bearings, for grinding mills, ore crushers, conveyors and hoisting machinery, sheave wheels, electric motors, centrifugal pumps, compressors, winches, blooming mill table rolls, broaching machine nuts, cranes, electric locomotives, gang saws, high speed grinders, machine tools, rod and bar mills, spindle bearings, wrist pins and machinery in general.

Mention R140 When Writing or Using Reader Service.

Engineering Service

Sam Tour & Co., Inc.,
44 Trinity Place, New York 6, N. Y.

A four-page folder, outlining the services and facilities of Sam Tour & Co., Inc., metallurgists, engineers and consultants, has just been issued. It contains views of the several laboratories housed in the company's own buildings and lists the nature of assignments undertaken in metallurgical and chemical engineering, metal finishing, corrosion, physical metallurgy and consultations.

Mention R141 When Writing or Using Reader Service.

High Strength Steel Booklet

The American Rolling Mill Co.,
Middletown, Ohio

Design and fabricating advantages of "Armco Low Alloy High Strength Steels" are presented in a new 24-page booklet. It describes two Armco low alloy steels with minimum yield strengths of 50,000 and 55,000 psi.

The booklet tells how Armco high strength steels enable a lighter sheet steel "shell" to carry more of the load in transportation equipment such as railway cars, trucks, buses, and aircraft parts. This lighter weight—without sacrifice of strength—assures safe high speeds and bigger pay-loads at less cost. There are sections on drawing, forming and welding, in addition to data on various designs.

Mention R142 When Writing or Using Reader Service.

Flash Welding

American Welding and Manufacturing Co.
Warren, Ohio

"Flash Welding—a Solution to Assembly of Forged Parts" is the title of this new four-page, two-color folder. A description of the advantages of flash welding as a saver of machine time, stock, weight, and handling is liberally illustrated with data and pictorial examples. Methods by which welded assemblies cut production costs are also described.

Mention R143 When Writing or Using Reader Service.

Temperature Control Cabinets

Precision Scientific Co.,
1750 N. Springfield Ave., Chicago 47, Ill.

Catalog 345 contains 48 illustrated pages pertaining to "Precision"—Freas constant temperature control cabinets, including an extensive variety of standard models, as well as many photographs of constant temperature cabinets and baths built to specifications. Standard cabinets include electrically heated ovens for laboratory drying operations, plastics, preheating conditioning, rubber aging; sterilizers, incubators, paraffin embedding ovens, low temperature cabinets, humidity control cabinets; steam-heated explosion-proof cabinets carrying underwriters' approval, vacuum ovens and combustion-tube furnaces for laboratory use. Included also is general information pertaining to mechanical and gravity convection heat transfer. Catalog is accompanied by price list.

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Forging Terms Defined

Kropp Forge Co.,
5301 W. Roosevelt Rd., Chicago 50, Ill.

The forging industry, like most others, has its own language—its distinctive terminology. Some of the words are centuries old; others have come into use within relatively recent years.

To aid users and buyers of forgings in getting a better knowledge of forging practice, the Kropp Forge Co. has compiled a comprehensive list of forging terms with their correct definitions and published them in a 20-page illustrated booklet entitled "Glossary of Forging Terms."

In this booklet words and terms are defined as used in forging practice, and it is recognized that other definitions are employed for some of the words in other fields for describing identical processes or operations.

A copy of this Glossary of Forging Terms may be obtained on request.

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Instruments and Controllers

The Hays Corp., Michigan City, Ind.

A handsome new booklet entitled "Hays Instruments and Controllers in Industry" has just been released. It features schematic drawings of typical applications of instruments and controllers to the following industrial control problems: Pressure reducing, pressure relief or back pressure, rate of flow, turbine-driven compressor control, and control of speed, liquid level and liquid density. The various instruments and controllers applicable to these problems are illustrated and described in detail.

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Columbium

Fansteel Metallurgical Corp., North Chicago, Ill.

This is said to be the first technical publication on pure columbium metal. Although columbium has been known as an element since 1801 and ferrocolumbium has been used extensively for some time, the pure metal was first made by this company in 1929. Only recently has the metal been prepared on a production basis. The principal present use of the pure metal is in electronic tube components. Columbium carbide has important uses in steel-cutting cemented carbide tools. This is a 12-page booklet known as Form F-414.

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The Metals REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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